SOME FIGURES ON BRICK PAVING. H. FOSTER BAIN.
MUNICIPAL VS. PRIVATE OWNERSHIP OF WATER-WORKS. PROF. C. W. TOOKE.
STATISTICS ON STREET PAVING IN AMERICAN CITIES.

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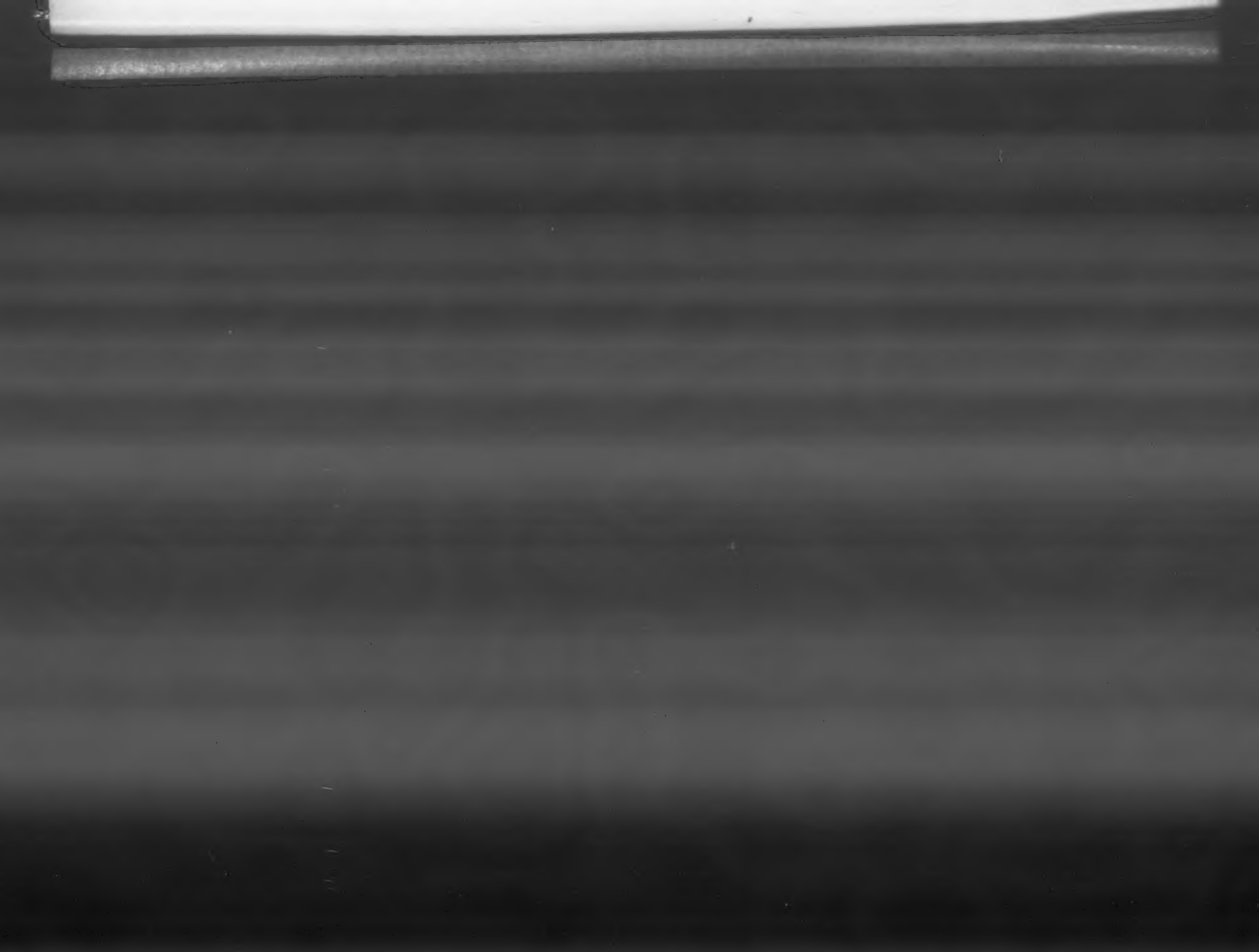

Municipal Engineering

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SOME FIGURES ON BRICK-PAVING.

By H. Foster Bain, Assistant State Geologist of Iowa.

Among the problems which confront the municipal engineer those relating to paving are numerous. The value of paved streets is becoming more appreciated, and as the cost of the work has been decreasing and familiarity with it increasing, paving of all kinds is being introduced rapidly, even in the smaller towns. Probably no paving material is being more rapidly introduced, in the central west at least, than brick. There is an impression that brick-paving is new, but this is correct only as applied to its wide use. Mrs. Trollope, in her delightful book, with which we can all now afford to laugh, speaks of brick-paved streets in Philadelphia in 1830, and in Holland the material has been used for more than a century. It is, however, only recently that brick has come into wide use. It is accordingly difficult to get accurate figures of cost, life, etc., and the tables given below may therefore be of some service.

These tables give the results obtained in some thirty representative cities of the region. It will be noted that the cost of the work has varied greatly, even in the same town. This is due, in part, to real differences in cost of material, but more largely to differences in the character of the foundation or in the specifications. An attempt has been made to indicate this in the first table.

Brick pavements are laid in two styles—one, known as two-course work, requiring 105 brick per square yard, only the upper course, however, being necessarily of No. 1 quality; and the other, one-course work, requiring 66 brick per square yard, all of No. 1 quality. One-course work was developed at Bloomington, Ill., as a result of the absence of any suitable material for making a concrete foundation. It has been widely adopted even where there was no especial need for the lower course.

In preparation for this work the contractor carefully grades down the street to a convex surface below the established grade line. All soft or spongy places are dug out and packed with suitable material. The surface is then thoroughly rolled with a twelve-ton steam roller. It is then covered to a depth of four inches with cinders and re-rolled, after which sufficient clean sand is spread over the cinders to give a regular convex surface and to make this foundation uniform four inches in thickness. On this sand is laid a course of brick upon their flat surface, long dimensions parallel to the street, laid closely together and all joints

broken. After the spalls are cleaned off dry screened sand is spread over this course of brick and brushed in so as to fill over this surface to a depth of one inch, and the upper surface carefully trimmed up. The upper course of brick is laid on this cushion, set on edge, end to end at right angles to the curb except at intersections. The brick are carefully laid in straight lines with joints broken with a lap of at least two inches, and none but whole brick used, except the necessary half brick at the curb. Dry sand is swept into the crevices, during which process the street is repeatedly rolled with a two-ton roller. The upper surface is covered with a half inch of sand, which in time packs into the cracks or is washed away. Such work, well done, with the best quality of pavers for the top course and good hard brick for the lower, costs now about $1.18 per square yard, including the clearing away, grading and the giving of suitable guaranties.

When suitable material is available for the manufacture of concrete it is customary to lay the one-course brick pavement over a concrete foundation. Occasionally a macadam foundation is put in and it is often possible to make an excellent street by simply repairing old macadam and laying the brick over it. This necessarily changes the surface grade a few inches. Where a concrete base is to be used the ground is prepared and rolled as for two-course brick. The concrete is then laid, being mixed on boards at the place where it is to be used, shoveled into place and tamped with a 25-pound bar until free water appears on the surface. The concrete base should be 6 inches thick for ordinary streets. When exceptionally heavy traffic is to be accommodated it may be thicker.

The mixture used at Des Moines is one part cement, two-parts sand, four parts gravel, broken stone, broken pipe or broken brick. The cement is not a Portland. The mixing requires nothing unusual or different from ordinary practice in making cement. Immediately upon tamping, the surface is covered with 2 inches of clean, sharp sand, and the whole left to set. Upon this sand the brick are laid in the same manner as the upper course is put down in the case of two-course brick.

The inspection of the paving brick is, in part, done before they are laid, and in part just before they are rolled and the filler put in. When a kiln is opened the brick are sorted into three grades—No. 1 pavers, No. 2 pavers, and builders. Naturally the judgment of the maker as to what is No. 1 is apt to be a bit more elastic than that of the inspector who watches out for the interests of the city. The inspector examines the brick as they come on the ground, though this inspection is often formal, and concerns lots of brick rather than individuals. Samples from each lot may be tested. After the bricks are set in position the inspectors go over the work, picking out brick which in their judgment are bad. All brick having spurs on them are either turned or hammered till the upper surface is smooth. When the surface has been properly inspected it is rolled, the filler put in, and the street opened for traffic. In case a soft filler has been used, a half-inch of sand is temporarily spread over the surface.

In the construction of a pavement the foundation is of first importance. Unfortunately, it does not always receive the attention

which it deserves. Under-drainage is but rarely provided and careful rolling is not always specified. When the foundation is not firm the upper surface becomes uneven, by displacement of the brick rather than through differential wear. Such a fault, once developed, tends to grow worse and at the same time does away with the light traction and good foothold which are among the great advantages which brick pavements offer. The character of the filler also very largely influences the perfection of the upper surface. Sand, pitch, asphaltic mixtures, grout and cement are the more common fillers. The first three are soft and the latter are hard. With soft filler it is impossible to prevent a certain amount of swimming of the brick. Sooner or later the latter become more or less displaced and are exposed to unequal wear. With a hard filler the surface course of brick is converted into practically a monolith. A street finished with a hard filler is much smoother and in fact is but little behind asphalt for bicycle and pleasure driving. The cost of each filler varies considerably. In Des Moines the total cost of sand in connection with the pavement is about eight cents per square yard or less than one cent for the filler. A tar filler, supposed to be a refined coal tar mixed with ten per cent. of asphaltum, costs $18 per ton or about 16 cts. per yard. A good Portland cement filler costs about 12 cts. per yard. These prices will naturally be found to vary a little with the location of the work. At Sioux City recent contracts show a sand filler costs about three cents less than pitch. The grout filler is sold by the patentee for a uniform price of 21 cts. per yard, the price including the cost of putting it in and one year guarantee.

The cost of paving as laid in various cities of the middle west is shown in the subjoined table (A). The figures given are representative contracts for each year and were obtained from the reports or from correspondence with various city engineers to whom the author is under great obligations for the assistance so given. In this and table (B) all fractions of one-half or less are disregarded, and all over are counted as whole numbers. The character of the foundation varies greatly, but in each case the work has been classified under that which comes nearest. Closer classification would make the table unduly cumbersome. The few averages given are averages by total work, not by contracts, so far, at least, as they were compiled by the author.

In the second table (B) the amount of paving in the various cities is given, the whole being expressed in square yards and distributed by years where possible. In reducing the terms to a uniform basis 20,990 square yards have been taken as equal to one average mile, that figure being obtained from the experience of Des Moines with over fifty miles of paving on all classes of streets. Wherever this multiple has entered into the results, the latter are set in full-face type. Not all the returns are equally accurate, but the results give the best approximation possible at present.

Since Des Moines has had experience with brick pavements for several years, and probably has more miles of brick pavement than any other city in this region, the following figures may be of interest. They give the price of paving per square yard since 1889, the averages being by contracts. The work includes both one- and two-course work and several different kinds of foundation. The figures

TABLE A.

REPRESENTATIVE PRICES OF BRICK PAVING.

	1889.	1890.	1891.	1892.	1893.	1894.	1895.	1896.	1897.	1898.	AVERAGE.	REMARKS.
Atchison, Kan.	1.89*	1.90*	1.68*			.92‖	.89§	.75§ .93§	.70‖ .72§			Two-course work. Galesburg brick, 1888, at $2.00 and $2.18.
	1.90*	1.92*					.98§	.85§	.71§		1.80	
Beatrice, Neb.										1.50*		
Bloomington, Ill.										1.15*		
Cedar Rapids, Iowa			1.50*¶	1.50*¶				1.16¶	.98¶	.98¶		
Clinton, Iowa	1.39¶	1.30¶	1.18¶ 1.30¶	1.28¶	1.33¶ 1.37¶	1.35¶ 1.44¶						
	*	1.29¶	1.34¶	1.30¶	1.39* 1.45¶	1.35¶						
Council Bluffs, Iowa	1.62*	1.40*	1.36*	1.36*	1.40*	1.33*	1.25*	1.85*		1.21*	1.38*	Two course local brick, 1888, at $1.84.
Creston, Iowa.											2.33*	
Davenport, Iowa.										1.29†		Concrete, 5 inches.
										1.32†		
Des Moines, Iowa.	1.29* 1.75*		1.55* 1.60*	1.53* 1.73*	1.35† 1.66*	1.23* 1.52*	1.04* 1.56†	1.10* 1.41†	.79‖ 1.22†			Price for 1898 average all work that year.
	1.50* 1.85*		1.59* 1.62*	1.56* 1.88*	1.49* 1.80†	1.65† 1.71†	1.15* 1.56†	1.36†	1.00‖ 1.15*	1.31†		
							1.25† 1.18†					
Dubuque, Iowa				1.69†			1.35† 1.37†		1.37†			
									1.30† 1.05*			
Evanston, Ill.								1.98†	1.40† 1.53†			
							1.04‖	1.00¶ 1.35†		1.20† 1.18†		
Iowa City, Iowa.								1.17†	1.29†	1.19†		
											1.27† 1.40*¶	Concrete, 4 inches. The $1.20 work is Halwood blocks.
Joliet, Ill.											1.30† 1.20†	
Leavenworth, Kan.								1.00‖				
Marshalltown, Iowa				1.85*							1.25† 1.31†	
Mason City, Iowa										1.48†		
Minneapolis, Minn											1.90†	
				1.60*	1.65* 1.35*	1.44* 1.39	1.47* 1.43*		1.42* 1.33*	1.37* 1.29*		
Oskaloosa, Iowa.				1.65*	1.75* 1.68*	1.48* 1.47*	1.49* 1.44*		1.47* 1.39*	1.35*		
		1.50■ 1.45■	2.04† 1.97■	1.85¶ 1.49■	1.49*	1.39† 1.52†	1.25† 1.34†	1.82† 1.45†				
Peoria, Ill.	1.50■	1.54■ 1.60■	1.59■	1.58■	1.47■	1.47■ 1.60†	1.30† 1.36†	1.37* 1.64†				
			1.37▲						1.10▲	1.83†		
Rockford, Ill.			1.76▲*									
											1.60*† 1.70*†	The higher priced work was before 1893.
Rock Island, Ill.											1.05† 1.80†	
Sedalia, Mo.		1.79†	1.78†							1.20‖		
				1.44*					1.80†	1.69†		
Sioux City, Iowa.			1.55*	1.59*					1.86†	1.79*		
							1.18†	97† 1.11*	1.05*	1.22* 1.15*		
Springfield, Ill.							1.33†	1.02●	1.02*	1.24*		
		1.57* 1.60*	1.70*	1.35* 1.66*								
St. Joseph, Mo.	1.75*	1.67* 1.75†	1.72*	1.63* 1.74*	1.65*					1.80†		
St. Paul, Minn											61†	Blocks, $1.26–$1.65.
St. Louis, Mo.											99†	
									1.08†			
Waverly, Iowa												
Winona, Minn.					1.44§						2.02†	Between 1890–92.
Wichita, Kan.												

* Two course work.
† On concrete.
‡ On old concrete.

§ On sand or planks.
* On macadam.
▲ On rubble.

‖ On old macadam.
● On gravel concrete.
■ On six-inch gravel. One-course work unless specified otherwise. Concrete six inches unless specified.

TABLE B.

AMOUNT OF BRICK PAVING BY YEARS *

	1885	1886	1887	1888	1889	1890	1891	1892	1893	1894	1895	1896	1897	1898	Total Yards.	Total Miles	REMARKS.
Atchison, Kan	.....	.....	12,982	5,174	32,381	23,185	1,866	.....	.....	18,199	3,050	23,779	16,521	22,790	159,767	....	.....
Beatrice, Neb	.....	.....	.....	**41,980**	**10**	**4,950**	.....	.....	.....	.....	.....	.....	.....	.....	**146,930**	....	.....
Bloomington, Ill.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	**303,572**	18.75	.....
Cedar Rapids, Ia.	.....	.....	.....	.....	.....	.....	80,000	.....	.....	.....	.....	82,590	43,400	53,200	259.190	....	.....
Chicago, Ill.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	300.000	12.80	Laid in last four years.
Clinton, Ia.	.....	.....	.....	.....	...23,168	24,639	86,738	66,696	47,464	40.690	.....	.....	.....	.....	289.315	....	.....
Council Bluffs, Ia.	.....	.....	.....	3,713	22,509	..14,029	18,008	19,710	17,501	6,823	4,813	15,141	.....	29,938	152 185	....	.....
Creston, Ia	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	**31.485**	1.50	Laid between 1892 and 1899.
Davenport, Ia.	....	.....	.....	.....	**6.066**	**28,462**	**46,462**	**36,575**	**52,832**	**45,254**	**53,084**	**47,710**	.....	32,186	**378,641**	.....	.....
Des Moines, Ia	.....	.....	.....	.....	67,959	.....	46,402	147,577	205,609	188,614	143,446	62.717	162,248	47,829	1,078 474	.....	Total includes alleys and some paving. Year not specified.
Dubuque, Ia	.....	.....	.....	.....	.....	.....	.....	*56,000	6,000	.....	48,300	.....	16,500	.....	126.8 0	5.00	*Laid previous to 1892.
Evanston, Ill.	.....	.....	.....	.....	.....	.....	.....	8,508	.....	7,677	16 319	10,403	.....	.....	42,907	....	.....
Iowa City, Ia.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	18,436	22,937	12,945	13,178	67.496	....	.....
Joliet, Ill.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	**146,730**	7.00	.....
Marshalltown, Ia.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	**51,006**	7.43	.....
Mason City, Ia	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	9,642	9.642	....	.....
Minneapolis, Minn	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.871	14,484	27,938	18,168	61.461	.....	.....
Oskaloosa, Ia	.....	.....	.....	.....	.....	.....	19,246	18,620	25,437	19.692	18,237	.. ..	15,944	20,571	132,749	....	.....
Peoria, Ill.	9,226	3,370	8,114	.....	11,350	93,119	21.218	48,631	6,745	95,927	79,905	95,589	.....	.....	473.194	19.81	.....
Rockford, Ill.	.....	.....	.....	.....	.....	.....	44,600	.....	.....	.....	.....	.....	8,000	4,430	57.030	.....	.....
Rock Island, Ill.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	**251,880**	12.00	Laid in last nine years.
Sedalia, Mo	.....	.....	.....	.....	.....	19,700	12.200	.....	.....	.....	.....	.....	.....	11.600	43,500	....	.....
Sioux City, Ia.	.....	.....	.....	.....	.....	.....	5.640	27,106	.....	.....	.....	.....	30,237	39,600	102,583	....	.....
Springfield, Ill.	.....	.....	.....	**7,660**	**1,081**	**11,580**	**147**	**23,299**	**69,267**	**78,177**	**109.358**	**74,575**	**20,791**	**31,485**	**429,420**	....	.....
St. Joseph, Mo	.....	.....	.....	.....	10,752	38,345	5,779	38,454	8,960	...1,029	4,114	.....	.....	.....	107,433	....	.....
St. Paul, Minn	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	11.676	.59	.....
St. Louis, Mo	.....	.....	.....	.....	.....	.....	.....	.....	.....	**70,107**	**136,855**	**231,730**	**89,837**	.....	**528,529**	25.18	Including 13.66 miles alleys and 86 miles "block."
Waverly, Ia	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	14,763	.....	14,763	.....	.....
Winona, Minn	.....	.....	.....	.....	.....	.....	.....	.....	72,874	.....	.....	.....	.....	.....	72,874	.....	.....
Witchita, Kan	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	10,417	.....	Laid between January, 1890 and May, 1892.

*In compiling this table 20,990 square yards has been taken as the equivalent of one mile of paving. Where this figure enters into the result, the figures are set in bold-faced type.

are influenced by the fall in prices of brick and cement, the closer inspection of recent years, the growing use of one-course cement foundations, and the ordinary market fluctuations. The recent rise in price is due to the better quality of pavement required:

Year.	Per Square Yard.
1889	$1 66
1891	1 59
1892	1 62
1893	1 57
1894	1 57
1895	1 23
1896	1 29
1897	1 33
1898	1 31

Owing to the uncertainty of payment caused by the recent decision of Judge Phillips, but little pavement is being laid this season, but all that are interested in the subject agree that the present is but a temporary backset. If the present law is such as to practically prevent paving, that simply means that new laws will be enacted. The necessity for paving is too great and the desire for it too widespread to allow any other conclusion.

PRIVATE VERSUS MUNICIPAL OWNERSHIP.

A REVIEW OF THE DANVILLE WATER CASE.

By C. W. Tooke, Professor of Law, University of Illinois.

In February of the present year, the supreme court of the state of Illinois handed down a decision of more than passing importance as bearing on the relation of the municipalities of the state to companies operating under municipal franchises. Incidentally, also, the decision may serve as a text for a few thoughts on the much mooted question of municipal versus private ownership of public service industries. I refer to the case of the City of Danville v. The Danville Water Company, reported in volume 178 of the Illinois Official Reporter, at page 299.

The legal phase of the question at issue may be passed over with brief comment. The original action was brought by the water company against the city to recover for a supply of water furnished to the city by the company through its hydrants for the quarter beginning May 1, 1895, and ending August 1, 1895, the declaration charging that according to the terms of the ordinance under which the water company claimed to have constructed its works and to have furnished the water, the city was liable to pay to the company $2,620.62 on August 1, 1895.

The city filed three special pleas, all of which admitted a liability to pay to the company $1,930 of the amount claimed in the declaration, but denied the liability of the city to pay the full amount, upon the ground that by the terms of ordinances passed by the city subsequent in date to the original ordinance under which the company began to furnish water to the city, the rates which the city was bound to pay as rentals for hydrants had been reduced. The original ordinance referred to above was passed November 9, 1882, and granted to the company the privilege of constructing and maintaining water-

works and the right to use the streets of the city for that purpose for the term of thirty years, specifying the character and capacity of the works, the source of supply and other details. Further, by the terms of the ordinance the city was to rent of the water company 100 fire hydrants for the term of thirty years, at the rate of $75 each per year, payable quarterly. All hydrant rentals in excess of 100 were to be paid for at the rate of $62.50 each per annum for the next forty hydrants, and for all in excess of 140 the rate was to be $50 each per annum for the balance of the thirty years. By an ordinance passed June 21, 1894, and accepted by the company, the rental of some of the hydrants was reduced from $62.50 to $50 per annum, and an arrangement made that all additional hydrants should be rented to the city at the rate of $40 per annum.

The city council, however, on January 17, 1895, acting under the authority of an act of the legislature approved June 6, 1891, and entitled "An act to enable cities incorporated under any general or special law of this state to fix the rates and charges for the supply of water furnished by any individual, company or corporation to any city * * * and the inhabitants thereof" (Laws of 1891, page 85), passed an ordinance reducing the rental rates on the first 140 hydrants to $50, and on all other hydrants to $40 each per annum.

The supreme court held that the city of Danville did not have the power in 1882 to bind itself irrevocably to pay the rates at that time agreed upon; that the provisions of the general incorporation act enter into and form a part of the charter of every company organized thereunder; and that by section 9 of such act (I Starr & Curtis' Ann. Stat., 2d ed., p. 1006) the legislature had reserved the right to regulate the rates of water companies organized thereunder, a right delegated to the city by the act of June 6, 1891, and legitimately exercised by the city in the passage of the ordinance of January 17, 1895.

It is not my purpose to discuss the soundness of the decision from a legal point of view, although it is worthy of note that three of the justices dissented from the opinion of the majority of the court. But it may be worth while to consider briefly the bearing of the case upon the question of the relative efficiency of private as against public ownership of municipal monopolies. Since the power to contract for water supply is limited by the continuing right of the city authorities to fix from time to time rates and charges that shall be just and reasonable," subject only to review by the circuit court, it may be well to inquire in this particular case whether the charges of the company, fixed by the original ordinance, were unreasonable, and also to consider how valid an argument for municipal ownership can be drawn from the defects in the original agreement between the company and the city.

The terms of the agreement must be considered in connection with the size of the city and its prospective increase in population. Danville lies on the Vermillion river, a tributary of the Wabash, 125 miles south of Chicago.

The principal terms of the franchise of 1882, under which the present company operates, are as follows: "The source of supply shall be the north fork of the Vermillion river, at a point above the present sewerage of the city, north of Fairchild street." "The works

shall be tested by throwing six simultaneous fire streams from six different hydrants, in the business part of the city, through a fifty-foot section of hose and one-inch nozzle, to a height of 100 feet; and at another time, the throwing of four simultaneous effective fire streams in other parts of the city." The company can be compelled by the city to extend its mains when it can be shown that such extension will yield "a steady additional revenue of $100 per annum from every 300 feet of extension, either from responsible private consumers, secured by written agreement, or the rental of public fire hydrants, upon the terms hereinafter stated."

A casual examination of this last clause will reveal its uselessness in giving the city the power to compel the company to extend its mains. The revenue that must be assured is about two-thirds the cost of the extension, so excessive in fact that the council can never exercise the power contemplated unless the hydrants are placed unreasonably close together, and then only when the rates of the original agreement are paid for their rental. So, too, according to the testimony of competent engineers, the fire test requirements are very inadequate for a city having a population of 15,000, who assert that the least requirement should be ten 250 gallon fire streams. The authorities also state that the length of hose to be used in a test should be 300 feet and that the usual fire nozzle for cities of this size is 1¼ inches in diameter. The hydrant pressure that will throw a stream 100 feet high from a 1-inch ring nozzle at the end of 50 feet of 2½-inch hose will throw a stream only 40 feet high from a 1¼-inch nozzle at the end of 300 feet of 2½-inch hose. But the most patent defect in this term of the contract is that the test is to be made when the works are completed, that no provision is made for other tests at any subsequent time, and that the effect of the prospective growth of the city upon its need of fire protection is utterly ignored.

A clause of the franchise gives the city the right to purchase at the end of five, ten, twenty and thirty years after the completion of the works; but here again the terms make the right practically worthless: "If the city and the company fail to agree on the price, there shall be appointed three disinterested non-resident appraisers, one of whom shall be appointed by the company, one by the city, and one by the two so appointed." "In determining the value of the plant the appraisers shall take into consideration the productive value of such water-works' right, privileges and property. If there is no existing hydrant contract with the city at the time of making the appraisement, the last existing contract shall be included in the estimated productive value as though still in existence." Thus it can be seen that, according to this last clause, in case the city exercises its option to pay the award of appraisers, it must pay the estimated present value of a large amount of revenue that would cease, in part, as soon as the purchase was made, or, if the contract had already expired, the value of revenue that at the time had no existence.

That the original hydrant charges were excessive could be readily shown by a comparison with the franchises of other private companies which furnish water to cities of the same population. Mr. Ralph P. Brower, who made an exhaustive investigation of this plant in 1897, and to whom I am in-

debted for much valuable technical information on the subject, came to the conclusion that the city could build for itself a far better and more efficient plant, serviceable for twenty years, at a cost of $130,000, bonds to be issued at five per cent., and that the saving to the taxpayers, besides paying for the plant, would be no less than $167,000 from hydrant rentals alone, the operating expenses to be paid from the charges to private consumers. That is, that the city could pay itself $69.30 a hydrant per annum, instead of $76.64 to the water company, and at the end of twenty years would own its own plant, the original cost of which would be $130,000, the extensions to be paid for by special assessments. The estimates for hydrant rentals taken by Mr. Brower for this comparison are not those of the original ordinance, but the rates that were in force after the voluntary reduction made by the water company in 1894.

The Danville water franchise is not unique, but only a fair example given by many other cities to private companies. Mr. Brower builds up a seemingly strong argument in favor of municipal ownership by demonstrating how much could be saved to the city by owning and operating its own plant. The weakness of the argument lies in the fact that it does not and can not show that such a saving would be made by the city. Indeed, the inefficiency of the council that granted the franchise and the defects of that instrument itself rather tend to show that the city under the then existing methods of doing business would have been even less successful had it attempted in 1882 to build and operate its own plant. Independently of this phase of the question, no one can doubt the wisdom of the legislature in reserving the power to regulate water rates, when the municipal authorities are not held responsible to any superior in the granting of important franchises. It seems that the reservation of such a power is the only safeguard afforded to the city against the letting of franchises by inefficient or unprincipled boards of aldermen.

On the other hand, what security is left to a private company that has obtained a favorable franchise against the arbitrary action of the council from time to time? Either the company must stand a long siege of litigation with the probability of defeat if its rates are found to be at all excessive, or the officials of the company must see to it that the members of the council shall take no steps in this direction without first consulting them and getting their consent. A common council that is so inefficient as to be unable to understand the terms of a franchise will not be able, in all probability, to determine accurately what charges are reasonable and just. So that both from corrupt councils and from those that are right minded but incompetent the private company must suffer persecution.

The prime cause of the difficulty that we have to acknowledge in cases like the one in hand, as well as in cases where municipal ownership is a failure, is a lack of a properly organized control by the state authorities. A state board of municipal public works, which a city would be bound to consult before letting a contract or granting a franchise, even if its functions were merely advisory, would prevent many serious mistakes. Assuming that such an administrative board would be both efficient and incorruptible, the legislature

could safely make its approval of a municipal franchise final so far as the terms under which a private company binds itself to supply service are concerned. Upon this program the advocates of private and municipal ownership alike should unite. Only thus, in view of the decision of the court in the case cited, can the private company be properly protected, while municipal ownership without such supervision is shown by experience to be in many instances a very hazardous experiment. We do not advocate this program as a new remedy, nor as a panacea for municipal ills, but only because experience has shown that it is the only method that has been successful in uniformly assuring to cities an honest and efficient management of those public service industries demanded by the modern municipality.

THE TESTING LABORATORY OF THE CITY OF PHILADELPHIA.*

By Richard L. Humphrey, Engineer in Charge.

It is nearly three years ago that I had the pleasure of presenting to the public a paper on "The Cement Laboratory of the City of Philadelphia: Its Equipment and Methods." Since that time there has been a gradual development in the scope and the amount of work accomplished.

The sieving apparatus to which reference was made in my former paper has been installed, and is in constant service. Prior to the installation the sieving was done by hand; the operation was slow and laborious, which produced an unconscious tendency to slight the work. The sieving apparatus now in use is shown in figure 1. It is operated by a small electric motor, and consists of a wooden frame (1 foot 10 inches long, 14 inches wide, and 10 inches deep) supported by four legs; a box, 14 inches long, 10 inches wide and deep, fits closely into the frame. This box has trunnions in the center of two sides, which move in grooves in the outside frame; and is moved to and fro by a crank connected to a crank disc having a throw of 1½ inches. The box holds four sets of brass sieves, each set consisting of a No. 100 and a No. 200 sieve, a cover, and a pan, all nesting into each other. These sieves are held in place by means of two clamps. The driving pulley makes 100 revolutions per minute, and the box holding the sieves makes 200 movements per minute, to and fro. The sieving frame has a tilting motion, and the rapidity of the motion imparts to it a jerking movement.

The sieving is continued until not more than $\frac{1}{10}$ of one per cent. passes through the sieves after five minutes' continuous sieving.

For the determination of the abrasive qualities of materials by impact and wear, a machine (Fig. 2), usually known as a rattler, has been installed.

This apparatus consists of a cast-iron polygonal barrel, 30 inches in diameter and 42 inches long, hav

*Read before the Engineer's Club of Philadelphia.

ing 14 staves ¼ of an inch apart. Two of these staves can be removed for the purpose of inserting the charge. There is a movable diaphragm in the barrel, which permits reducing the working or test-chamber to any desired size less than 42 inches. The barrel rests on trunnions, and is driven by gearing which gives it a motion of about thirty-five revolutions per minute. A five-figure counter records the number of revolutions.

In some tests cast-iron bricks are used as the abraiding material; these bricks are 5 inches long, 3 inches wide, and 1½ inches thick, and weigh about six pounds each. The barrel is entirely encased in wood to confine the dust and deaden the noise.

Three methods for determining the percentage of loss are being tried: (1) The charge is made up of the brick under test equal in volume to fifteen per cent. of the volume of a test chamber 30 inches in diameter and 20 inches long; (2) the charge is equal in volume to fifteen per cent. of the volume of the test-chamber, and consists of 100 pounds of cast-iron bricks,

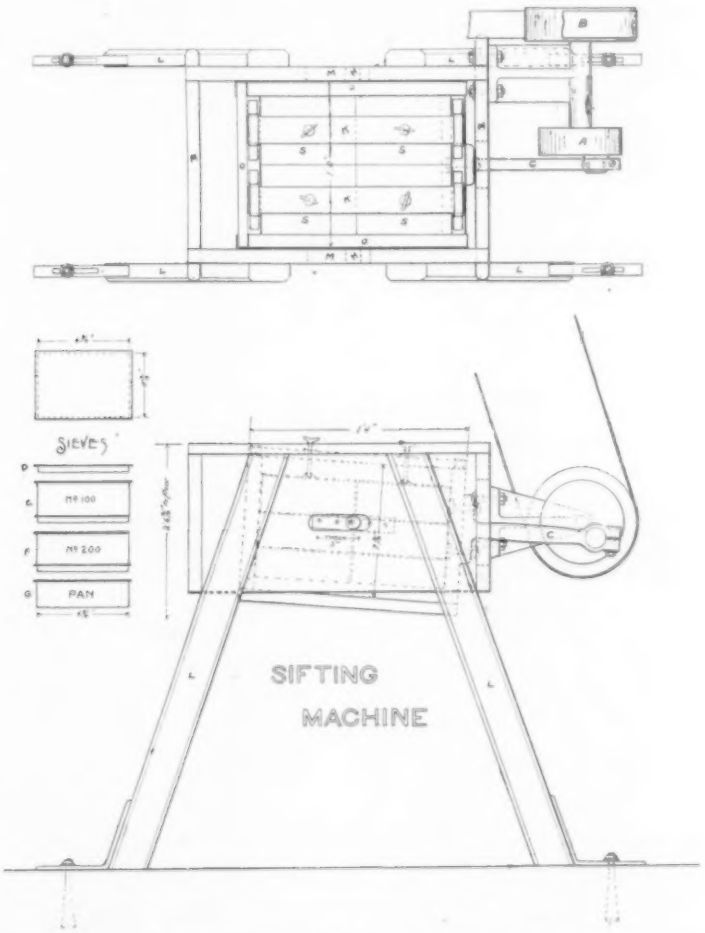
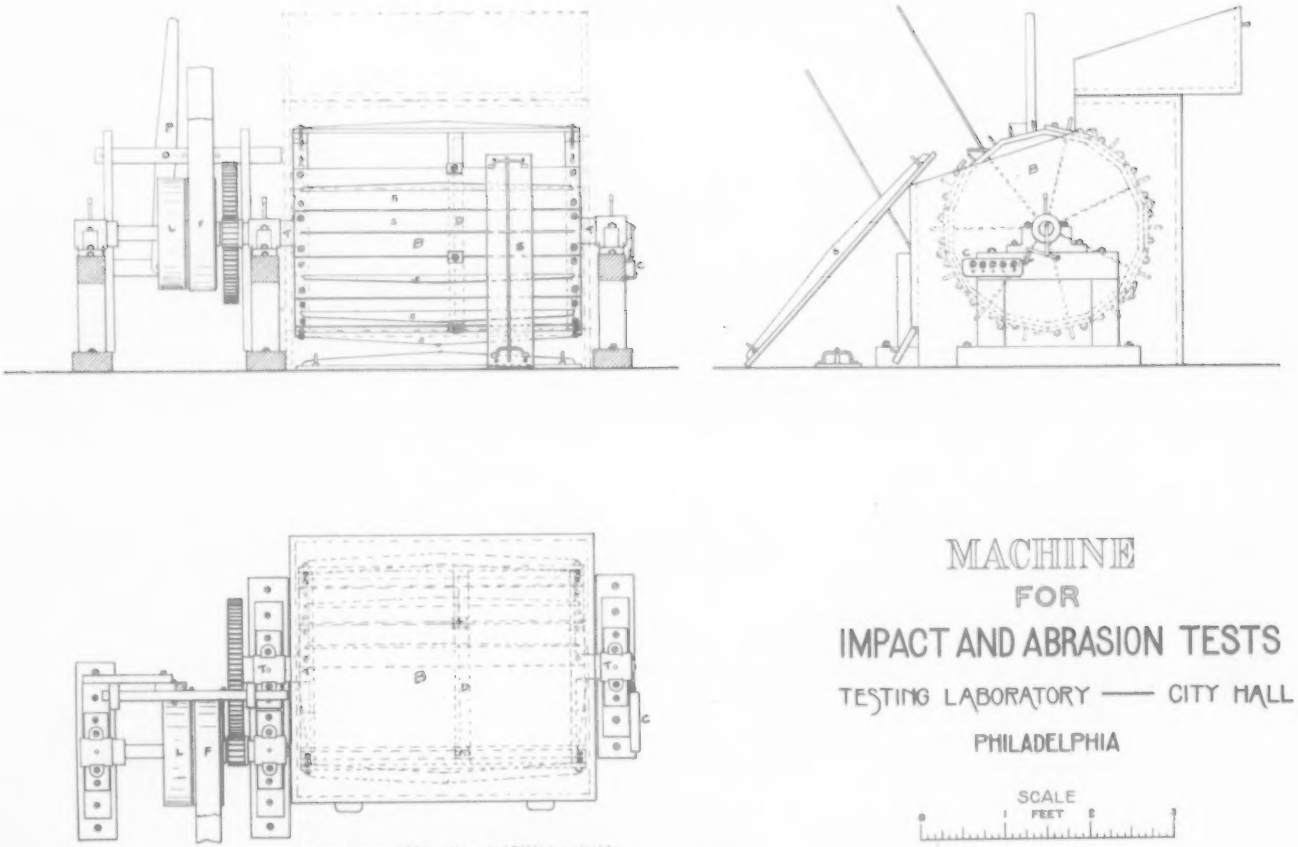


FIG. 1. DETAILS OF SIFTING MACHINE.

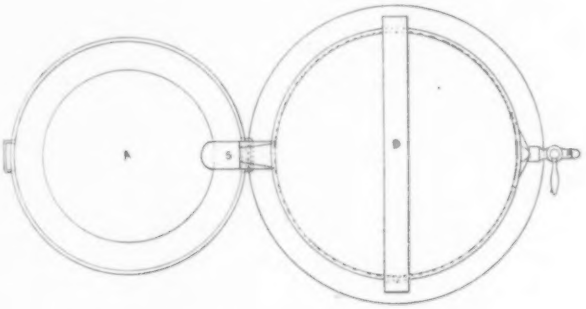


Notes: Drum 28⅝ in. diam. X 40⅜ in. long inside
Length of testing chamber variable by movable diaphragm
14 staves each 6⅛ in. wide separated by ¼ inch spaces
35 revolutions per minute.

FIG. 2. DETAILS OF IMPACT AND ABRASION MACHINE.

and the balance is made up of the bricks under test; (3) Johnson's method, in which the charge consists of 10 cast-iron bricks and five of the bricks under test.

For determining the specific gravity of brick, blocks of stone and concrete, etc., the apparatus shown in figure 3 has been constructed.



SPECIFIC GRAVITY APPARATUS

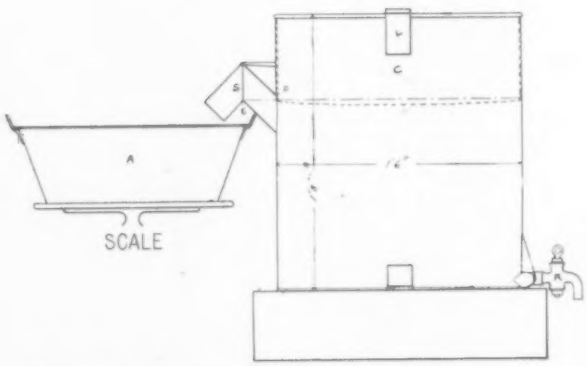


FIG. 3. DETAILS OF SPECIFIC GRAVITY APPARATUS.

It consists of a heavy sheet-copper tank, tinned on the inside, 1 foot 6 inches in diameter and 1 foot 8 inches high. Into the top of this tank fits a cup 6 inches deep and ¼ of an inch less in diameter than the tank. Across the top of this cup is fastened a brass strip, which projects beyond the sides of the cup, and when the latter is in position the brass strip rests on two lugs on the sides of the tank. The bottom of the cup extends ⅛ of an inch below the normal level of the water in the tank. The cup is made convex on the bottom to prevent the collection of air bubbles. The normal level is maintained at the same height by means of an L-shaped spout having a two-inch circular orifice. The lower point of the elbow of the spout is ¼ of an inch below the upper edge of the opening made by the spout into the tank. A spigot at the lower part of the tank permits of emptying the tank at the end of the tests.

To use the apparatus the cup is lifted out and the tank is filled with water until it overflows through the spout. The cup is then placed

in position and brought to a bearing on the brass lugs. The cup forces out a small quantity of water and changes the level of the water in the tank from a variable level to a constant artificial level. An aluminium pan having a capacity of about 3½ gallons is placed under the spout. The cup is carefully lifted out from the tank and placed over the pan, so that the drippings are not lost. The brick or block of stone to be tested, having been previously weighed, is placed in the tank; the cup is then gently replaced, thus restoring the former artificial level. The water in the pan is that which has been displaced by the brick or block of stone. The weight of this water represents the displaced weight, or the loss of weight in water, and the specific gravity is obtained by dividing the weight in air by the loss of weight in water.

This test is made on bricks or stones, etc., which are thoroughly saturated with water, usually immediately after making the absorption test; a correction being made for the water absorbed by the brick or stone. The results by this method are accurate to the second decimal place.

For preserving concrete test-tubes, and making absorption tests, a soapstone tank has been added; this is 7 feet long, 30 inches wide, and 16 inches deep, and is provided with a supply of running water maintained at a constant temperature.

These are the principal new features in the laboratory equipment; the minor additions, which have been provided to facilitate the work and bring the laboratory up to a high standard of efficiency, are too numerous to permit of mention at this time.

In the last six years over 4,000 samples, covering all grades of natural, Portland, slag and sand cements, have been examined and tested. In making these tests over 60,000 briquettes have been molded, of which over 50,000 briquettes have been broken, and the remainder, over 6,000, will be broken at intervals up to ten years.

In making these tests many interesting phenomena in the behavior of cement have occurred; I have selected at random a few of the most characteristic occurrences to show some of the vagaries in the hardening of cement.

The following tests are from a natural cement, which cracked and checked badly after three days' immersion in water, and at seven days there was a decided loss of strength and signs of disintegration:

	Tensile Strength in lbs. per sq. in.				
	24 hours.	7 days.	28 days.	1 yr.	4 yrs.
Neat cement	135	94	28	218	530
1 cement, 2 sand	148	219	41	...	394

The condition of all the briquettes is shown in figure 8 (upper diagram). The twenty-eight day tests are the average of three briquettes; the neat briquettes gave a minimum strength of twenty pounds and a maximum strength of thirty-four pounds, while the sand (standard quartz) briquettes gave a minimum strength of thirty pounds and a maximum strength of forty six pounds. At the end of one and four years the tests showed that the cracking and checking had ceased and that the cement was hardening. And notwithstanding the fact that the briquettes were all badly cracked and checked, as those shown in figure 7, they yielded excellent results, tested in tension.

Here are some briquettes of natural cement made from mortar taken from the mixing-box on actual work:

	Tensile Strength in lbs. per sq. in.		
	4 months.	6 months.	3 years.
1 cement, 2 bar-sand	150	168	813

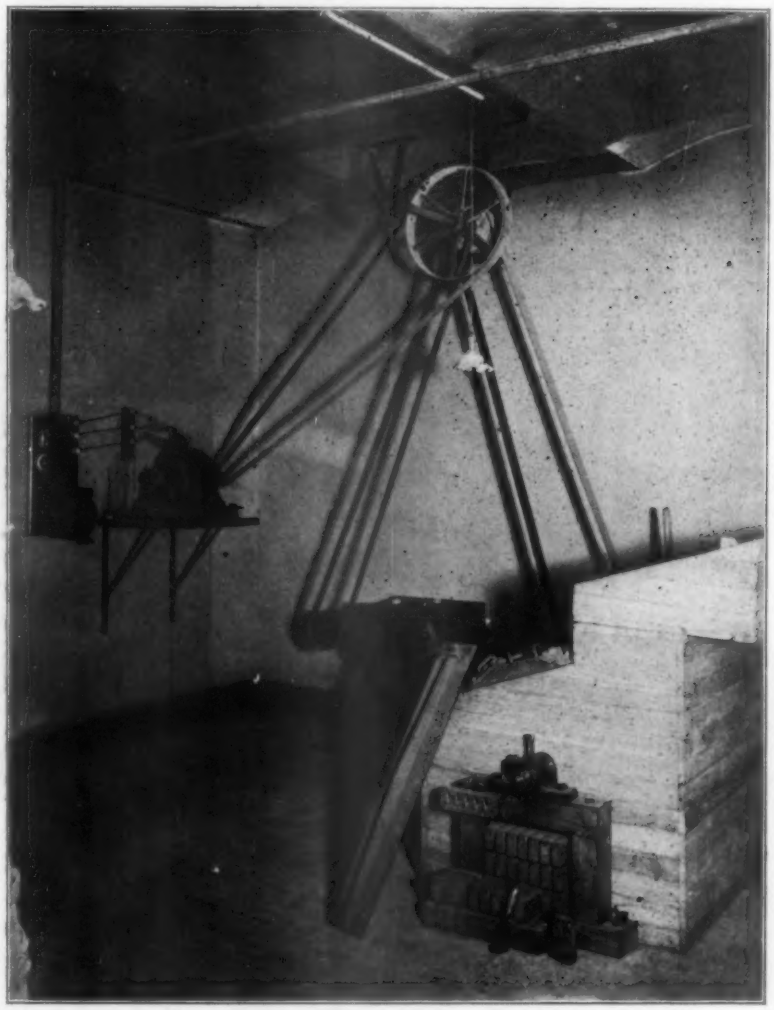
These briquettes during the first

stages were apparently disintegrating, and were so soft that it was impossible to obtain any strength from them at the usual periods of seven and twenty-eight days; they were, however, carefully preserved in water, and at four months had hardened and developed considerable strength.

It is a frequent occurrence for natural-cement briquettes composed of 2 parts of standard quartz-sand and 1 of cement to develop greater strength than the neat-cement briquettes.

This is shown by the following tests:

	Tensile Strength in lbs. per sq. in.			
	24 hours.	7 days.	28 days.	3 yrs.
Neat cement.....	139	278	337	493
1 cement, 2 sand..	86	201	280	596



Motor. Sifting Machine. Impact and Abrasion Machine.

FIG. 4. VIEW IN PHYSICAL LABORATORY.

Another remarkable test was obtained from briquettes made from mortar taken from the mixing-box, and composed of one part natural cement and two parts bar-sand. These briquettes were preserved on the work, having been immersed

in water after hard-set, and were subsequently frozen solid in the pan in which they had been immersed. In spite of this usage they developed the following tensile strengths:

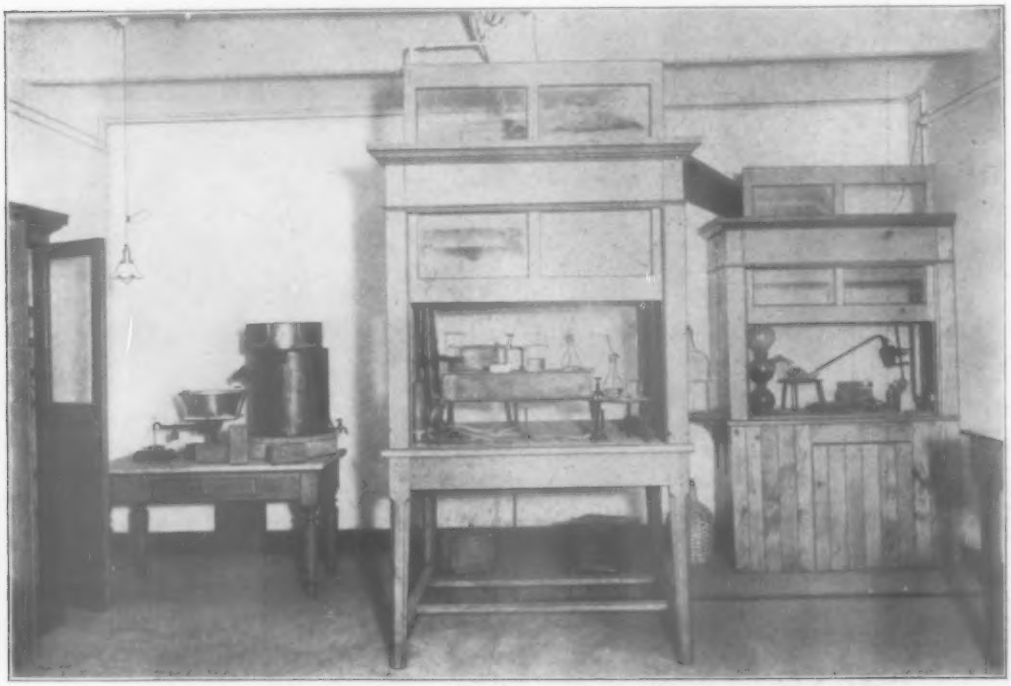
	Tensile Strength in lbs. per sq. in.			
	7 days.	28 days.	2 mos.	3 yrs.
1 cement, 2 bar-sand..	58	93	173	603

It has been my experience that retempering natural cement greatly reduces its early strength and generally impairs its ultimate strength. If, however, the retempering has not been too great, the cement will very gradually acquire strength.

The tests I have selected to illustrate this point were obtained from briquettes made from natural-cement mortar taken from the mixing-box on the work. The mortar had been retempered at the mixing-box by the mason's helper and by the mason himself; yet, notwithstanding this, the cement gradually developed strength, although it gave very poor short-time tests. The tests are as follows:

	Tensile Strength in lbs. per sq. in.		
	7 Days.	28 Days.	4 Years.
1 cement, 2 bar-sand....	85	55	585

In order, however, to give general ideas of the results of the tests of cements, I have prepared the accompanying diagrams, in which the results of the tests have been grouped into class averages.



Specific Gravity Apparatus. Hood. Hood.

FIG. 5. VIEW IN CHEMICAL LABORATORY.

In upper diagram, figure 8, results are shown of the tests of cement made over five years ago. It will be observed that there is no notable increase in strength beyond that attained at the end of six months. One interesting feature of the diagram is the showing made by the American natural cements; these cements, under the superior manipulation in the laboratory,

prove to be close competitors of the Portland cements of five years ago.

It is customary, on all work of importance, to test the value of cements by making briquettes from mortar taken directly from the mixing-box.

In the construction of the subway along Pennsylvania avenue it was necessary to underpin many of the buildings along the line of the work; in some cases this necessitated rebuilding the brick walls. This brick-work was laid up in lime mortar.

FIG. 6. VIEW OF OVER 20,000 BROKEN BRIQUETTES.

A series of briquettes was made from the lime mortar, used in this work, taken direct from the mixing-box. These briquettes hardened very slowly, and could not be removed from the molds until they were three or four days old. If placed in water as soon as they were removed from the molds, they gradually dissolved into a soft mass; They had, therefore, to be preserved in air, although they could be preserved in water after one or more months' exposure in the air.

In figure 8, diagram 2, the results of these lime-mortar tests are compiled, and for comparison the results of the tests of Portland and natural cement mortar taken from the mixing-box and made during the same period are added. The bar-sand and gravel and standard quartz-sand used in all these tests are shown in figure 7.

Tests have also been made of the

concrete as it is actually mixed for use. The test-specimens were 6-inch cubes. The concrete was composed of 1 part Portland cement, 3 parts gravel, and 6 parts broken stone (graded from ¼ of an inch up to 2 inches), and had an average weight of about 140 pounds per cubic foot. The mortar was composed of 1 part Portland cement and 3 parts gravel, and had an average weight of about 133 pounds per cubic foot.

and what passed through the sieve was perfecty sharp, clean grit, and not a clay, as is the usual case with gravels.

In connection with the lime-mortar tests, shown in figure 8, it may be of interest to quote from a book published in 1780, once in the possession of George Washington. It is entitled, "Experiments and Observations Made with a View of Improving the Art of Composing and Applying Calcareous Cements

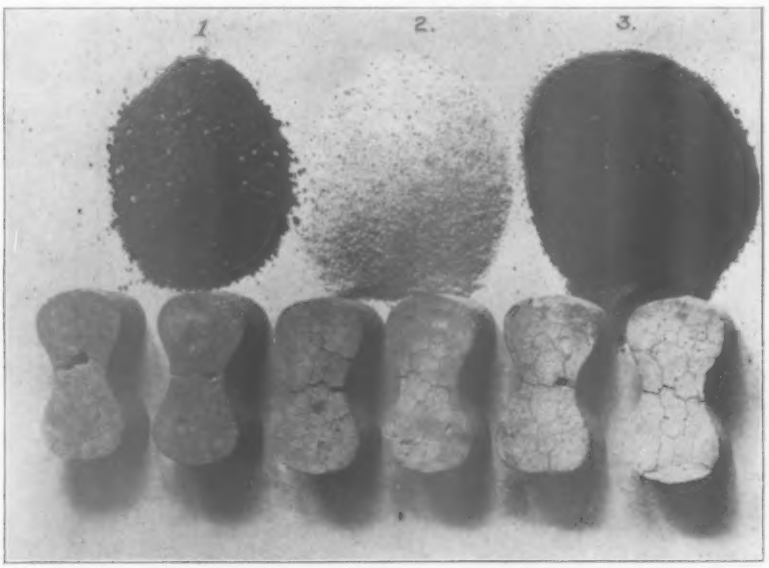


FIG. 7. VIEW OF GRAVEL, STANDARD QUARTZ, AND BAR SAND; ALSO CHECKED AND CRACKED BRIQUETTES.

In figure 8, diagram 3, the average results of the crushing tests of these cubes are shown. Attention is directed to the excellent results obtained by the use of the gravel. This gravel was sharp and clean and unusually well proportioned.

The following are the percentages of residue on the various sieves:

No. 10 sieve.....	16.56	No. 50 sieve... ...	20.30
No. 20 sieve.....	32.92	No. 100 sieve.....	12.54
No. 30 sieve.....	14.78	No. 200 sieve.....	1.84

Percentage passing No. 200 sieve, 1.03.

The residue on the No. 200 sieve

and Quicklime." In the introductory pages, the author, Dr. Byron Higgins, expresses himself as follows:

"As the strength and duration of our most useful and expensive buildings depend chiefly on the goodness of the cement with which they are constructed, I looked to the improvement of mortar as a subject of great importance in this country, particularly where the weather is so variable and trying, and the mortar commonly

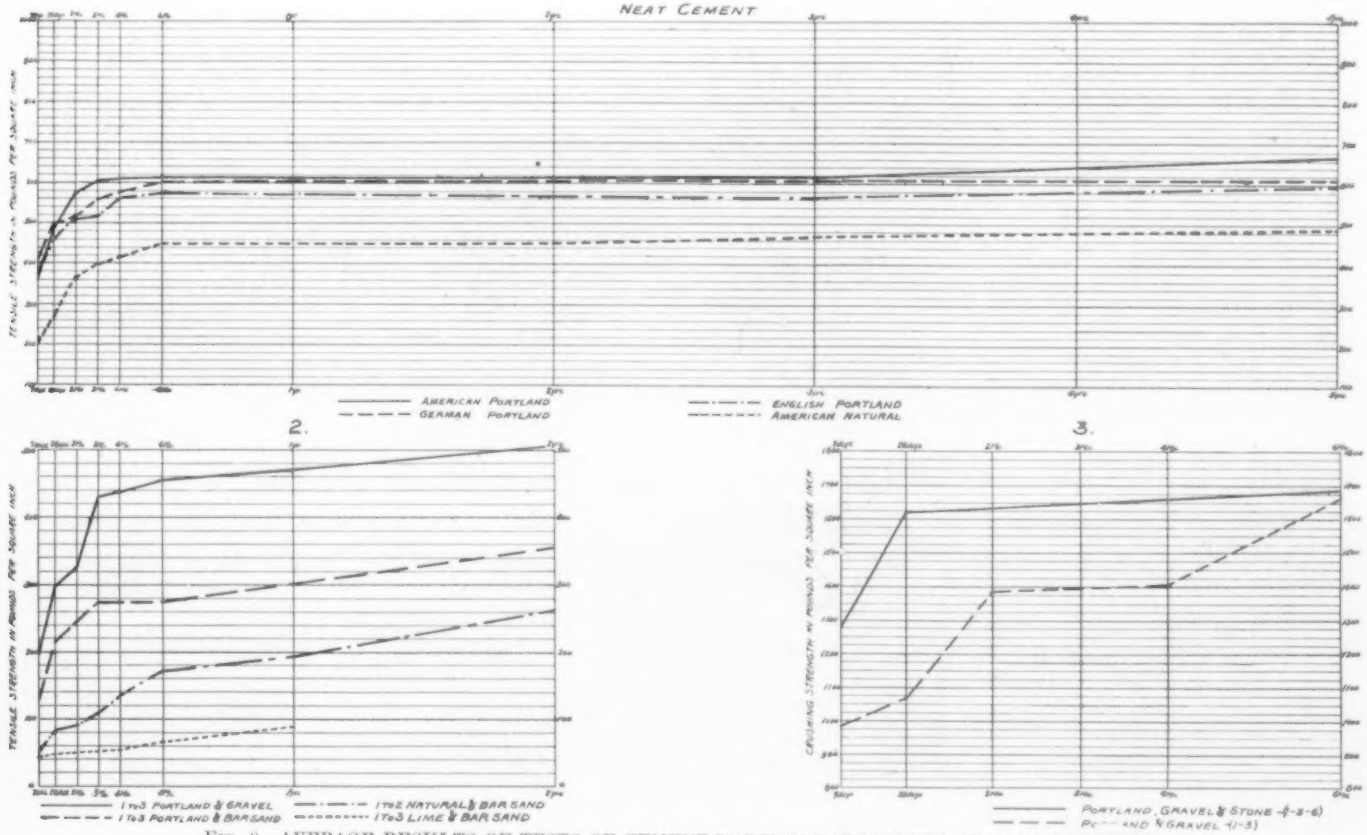


FIG. 8. AVERAGE RESULTS OF TESTS OF CEMENT MADE IN LABORATORY AND ON THE WORK.

used is so bad that the timbers of houses last longer than the walls, unless the moldering cement is frequently replaced by pointing. But feeling that many years are requisite for the greatest degree of induration which cementitious mixtures like mortar can acquire, and that the life of man is too short to allow any considerable improvements of them to be derived from such experiments as had hitherto been made, I resolved, in the beginning of the year 1775, to investigate, more closely than I had hitherto done, the principles on which the induration and strength of calcareous cements depend; not doubting that this would lead me, by an untried path, to recover or to excel the Roman cement, which in aqueducts and the most exposed structures has withstood every trial for fifteen hundred or two thousand years."

In 1859 John Grant began his celebrated tests of the cement used in the construction of the Southern Main Drainage Works of London. Prior to this year Roman cement was, with few exceptions, the only cement used for the inverts of the London sewers, the arches being set in blue lias lime.

The specifications for this work required that Portland cement should be of the best quality, finely ground, weigh 110 pounds per imperial bushel, and maintain a breaking load of 400 pounds on an area of 2¼ square inches, at the end of seven days, six days in water—equivalent to about 178 pounds per square inch.

The specifications of the city of Philadelphia in 1889 required Portland cement to be of the best quality, finely ground, weigh 112 pounds per imperial bushel, and develop a tensile strength of not less

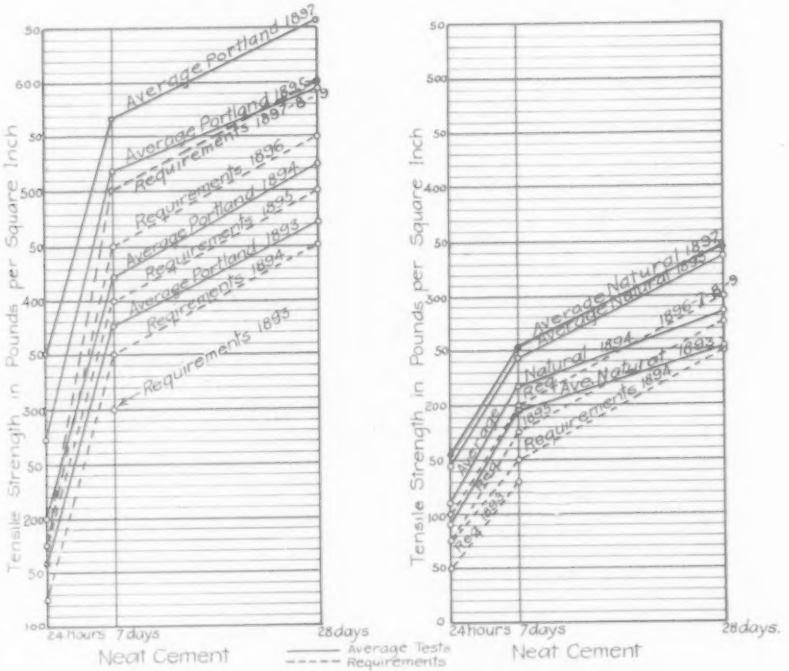


FIG. 9. AVERAGE TESTS AND REQUIREMENTS.

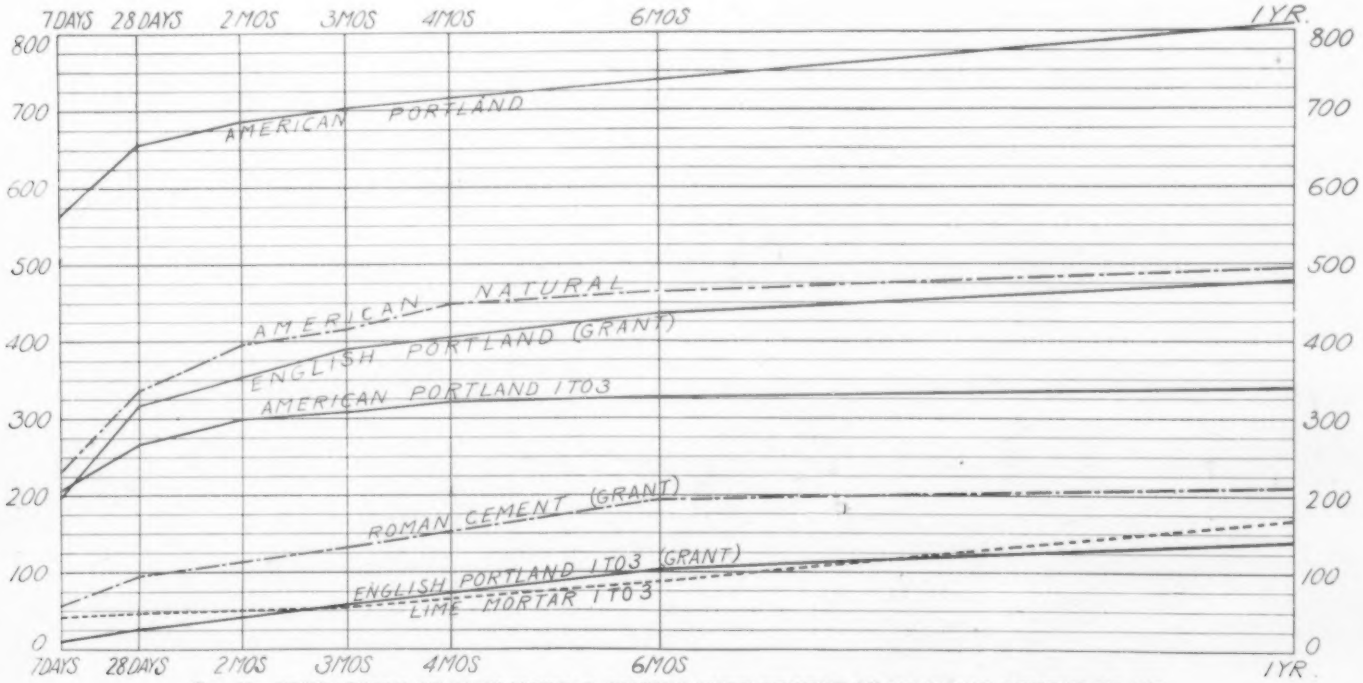


FIG. 10. COMPARISON OF LIME MORTAR CEMENT WITH CEMENT OF 1860-65 AND CEMENT OF 1897.

than 275 pounds, or more than 400 pounds, at the end of seven days, six days in water. Since the establishment of the laboratory, in 1892, the city requirements have been gradually raised each year, as was shown by the average results of the tests to be advisable.

In figure 9 it will be noticed that the average results of the tests each year exceeded the requirements for that year. I have shown on several occasions that the increase in the requirements each year has been accompanied by a decrease in the price of the cement, and I can not emphasize too strongly the fact that to-day the city is using cement at least fifty per cent. stronger, and from ten to twenty per cent. cheaper, than it was when the laboratory was first established.

In figure 10, I have plotted the average results of the tests of Portland and natural cement used in the city in 1897, the tests of lime mortar, which agree closely with those given by Vicat in 1818, and the results obtained by Grant from 1860 to 1865.

It will be noticed how much superior the cement of to-day is to that used in Grant's time, and to the lime mortar described by Vicat and Higgins. Whether the same superiority will be true of the cement at longer periods of time, only time will tell.

It is for this reason that the results of the five- and ten-year tests of the present high-testing cement will be so valuable. Until these results are obtained, we should withhold our judgment as to the merits of these cements.

ELEVENTH STREET, FROM PESTALOZZI TO LYNCH STREETS, ST. LOUIS, PAVED WITH BUENA VISTA ASPHALT.

STREET PAVING IN AMERICAN CITIES.

Compilation of Information Showing the Total of Pavements of various kinds in different cities.

[Compiled specially for Municipal Engineering.]

City or Town	Sheet Asphalt (all kinds)		Vulcanite Asphaltina or other Coal Tar products		Asphalt Block		Stone Block (all kinds)		Cobble or Boulder Stone		Brick (all kinds)		Wood (all kinds)		Telford Macadam and Gravel		Other Kinds what?	
	Sq. Yds.	Miles	Sq. Yds.	Miles	Sq. Yds.	Miles	Sq. Yds.	Miles	Sq. Yds.	Miles	Sq. Yds.	Miles	Sq. Yds.	Miles	Sq. Yds.	Miles	Sq. Yds.	Miles
Allegheny, Pa		23 98				2		24 78		20		12 34						
Albany, N.Y.	164 133	9 33					527 057	29 95			228 777	13 00			54 871	8 12		
Altoona, Pa	67 713				38 140		14 210		1 076		19 467							
Amsterdam, N.Y.	23 708	1 08					3 600	20			2 905	16			168 233	12 14		
Atlanta, Ga.		2 00						55 00				2 00		33		4 00		
Augusta, Ga.	51 398	1 00					24 207	1 00							468 566	20 15		
Aurora, Ill.												2 30		4 50				
Brooklyn, N.Y.	1 268 251	64 28			1 193	0 09	3 273 347	158 21	4 372 376	231 96	93 657	3 78			1 370 627	73 17		
Boston, Mass.	194 893	11 14	4 168	0 32	11 325	0 78	1 859 248	85 18	12 471	1 14	6 060	0 60			6 572 280	368 95	321 391	11 39
Baltimore, Md.	214 570	8 00			223 624	9 70	640 000	31 10	5 102 000	322 90	14 896	0 70						
Buffalo, N.Y.	3 900 531	211 64					2 181 936	108 54			105 740	6 65	742	0 08	54 258	2 99		
Bridgeport, Ct.		1 49						1 24								12 653		
Bloomington, Ill.	1 162											20 00				33		
Birmingham, Ala					1 220		68 500				4 000				1 200 000			
Burlington, Ia							61 363	1 56			263 361	11 93			153 430	7 38		
Burlington, Vt			4 768	0 23							3 091	0 15			429 391	32 33		
Bayonne, N.J.								1 56								8 70		
Bluffton, Ind	50 000	3 25									4 000	0 33				3 00		
Cincinnati, O		21 36						45 85		69 75		38 99		0 85		19 874		
Columbus, O	312 397	16 17					158 498	7 80	50 450	4 90	1 505 916	73 62				5 58		
Cambridge, Mass															51 530			
Charleston, S.C.		0 73						1 516		4 67						4 38		1 62
Canton, O.									4 000		235 500				30 000			
Cedar Rapids, Ia	7 600	0 32									332 093	13 18				3 00		
Cicero, Ill.		5 17										1 70		9 26		43 72		
Columbia, S.C.																		
Columbus, Ga.															34 000	1 10		
Concord, N.H.			6 698	0 33			12 985	0 38							25 105			
Detroit, Mich.	503 397	21 55					62 686	2 95			544 215	21 05	3 629 328	210 91	57 877	3 33		
Denver, Col.	371 249	13 66					65 521	2 29							331 728	14 19		
Dayton, O.	335 504	15 65			13 602	0 77	35 120	1 59			298 618	9 80				130 00		
Dallas Tex														12 23		19 26		
Davenport, Ia.											467 684	18 26				20 00		
Decatur, Ill.												20 00				1 50		
Evansville, Ind	33 000	1 62									560 000	23 13				5 00		
Erie, Pa		10 87				0 69		6 84				6 48						
East St Louis, Ill.							60 000				250 000				153 000			
Easton, Pa.												1 80				2 30		
Evanston, Ill.	48 416	2 47									94 806	4 21	188 670	8 32	393 992	19 03		
Elyria, O.	3 192	0 14									44 864	2 00			12 434	0 70		
Fall River, Mass	2 142							5 50		1 00								
Fitchburg, Mass							40 438	2 04	5 949	0 44					47 560	4 00		120 00
Fort Wayne, Ind	115 038	6 12			2 143	0 09			2 140	0 14	119 336	6 45	219 615	10 77	1 703	0 07		
Grand Rapids, Mich.		5 09		0 28						0 75		3 53		1 22		130 19		
Galveston, Tex											8 487		205 000	8 25				3 25
Gloucester, Mass								5 00										
Galesburg, Ill.												18 36						
Hartford, Ct.	87 140				35 438		12 415				1 428					70 05		
Hoboken, N.J.	84 000	4 25					285 000	14 90	5 000						900	0 20		
Holyoke, Mass						0 76		2 50				1 16				58 84		
Totals																		

STREET PAVING IN AMERICAN CITIES—CONTINUED.

City or Town	Sheet Asphalt (all kinds)		Vulcanite Asphaltina or other Coal Tar products		Asphalt Block		Stone Block (all kinds)		Cobble or Boulder Stone		Brick (all kinds)		Wood (all kinds)		Telford Macadam and Gravel		Other Kinds what?	
	Sq Yds.	Miles	Sq Yds.	Miles	Sq Yds.	Miles	Sq Yds.	Miles	Sq Yds.	Miles	Sq Yds.	Miles	Sq Yds.	Miles	Sq Yds.	Miles	Sq Yds.	Miles
Indianapolis, Ind		42.15		1.10						2.00		2.61		9.52		17.79		
Houston, Tex	20,250	0.87						0.19				6.53		3.11		5.96		
Hamilton, O					32,100	1.00	80,400	3.60							101,300	6.25		
Harrisburg, Pa	81,080	3.39			9,430	0.38			370	0.02	6,453	0.40			610,446	31.85		
Jackson, Mich	2,500								19,000		98,660				20000			
Jamestown, N.Y.							2,200	0.08			126,321	5.53						
Jersey City, N.J.	46,201	10.26						67.60				0.50				14.40		
Joliet, Ill.		0.43						0.25						2.00		10.00		
Kalamazoo, Mich.										0.17		1.01		4.53		0.06		
Kansas City, Kan		2.25						0.40				12.00		18.00		2.65		
Kansas City, Mo		59.66		6.51				2.12				27.36		11.19		31.33		
La Crosse, Wis																19.60		
Lafayette, Ind												2.23		0.41		35.00		
Lancaster, Pa		0.12				1.50		2.00						2.23		30.00		
Lawrence, Mass								2.80								14.25		
Lima, O	31,967	1.29	30,000	1.21							65,000					50.00		
Lincoln, Neb	6,200	0.14									333,000	13.50		9.00				
Lincoln, R.I.				0.25			1,600									2.50		
Little Rock, Ark								0.75				2.20				26.00		
Lockport, N.Y.	14,000	2.00									86,124	2.00						
Los Angeles, Cal		11.48						1.71				0.46				19.65		
Louisville, Ky.	179,544	8.40						2.22		10.00		24.33				95.38		
Lowell, Mass	5,719	0.27	12,783	0.73			295,985	13.06			2,000	0.09			87,200	4.45		
Malden, Mass																		
Memphis, Tenn.							337,290	19.47			111,008	8.00	32,799	1.90	704,028	28.63		
Meriden, Ct							7,627				10,630				40,000			
Muskegon, Mich.														1.525		1.67		
Montgomery, Ala							10,840				38,550				7,385			
Nashua, N.H.			2,500				38,000	1.75								4.00		
Nashville, Tenn.							46,626	2.64			24,023	1.88				206.90		
Newark, N.J.	391,360	28.11					948,760	44.89	295,680	4.03	79,400	3.76			236,270	11.28		
New Bedford, Mass	15,000	0.57			1,088	0.06	37,554	2.97	210,140	16.15					674,035	44.41		
New Brunswick, N.J.								1.36		2.91		0.08				6.00		
New Haven, Conn.	66,701	3.11	5,550	0.21	2,817	0.16	97,633	4.43	3,816	0.13	35,677	1.41			528,324	31.85		
Newport, R.I.		1.75														70.00		
Newton, Mass																148.00		
Norristown, Pa					3,500	0.12	18,000	1.00			82,000	4.00				23.00		
North Adams, Mass							3,140	0.19			15,695	0.67			19,207	1.22		
Northampton, Mass																13.00		
Oshkosh, Wisc														1.20		32.00		
Paterson, N.J.	24,150							3.50		3.00	20,000					60.00		
Pawtucket, R.I.	919	0.06	1,657	0.12			97,155	5.73			1,968	0.14				72.57		
Peoria, Ill.	160,233	7.57					29,622	1.10	17,506	0.90	473,194	19.72	9,176	0.32				
Petersburg, Va.									70,000							2.50		
Philadelphia, Pa.	3,120,902	190.72	72,726	12.77	178,000	19.17	5,760,509	351.13	2,920,664	58.71	1,777,123	107.34			1,946,774	185.36	17,882	3.02
Pittsfield, Mass																79.70		
Pittston, Pa	28,981	2.27									82,166	0.08						
Portland, Me								8.34		1.06						8.31		
Poughkeepsie, N.Y.	3,941				31,987						16,651							
Providence, R.I.	67,211	3.82	8,342	0.47			516,903	29.37	89,398	5.08	8,051	0.46				178.77		
Totals																		

STREET PAVING IN AMERICAN CITIES—CONTINUED.

City or Town	Sheet Asphalt (all kinds)		Vulcanite Asphaltina or other Coal Tar products		Asphalt Block		Stone Block (all kinds)		Cobble or Boulder Stone		Brick (all kinds)		Wood (all kinds)		Telford Macadam and Gravel		Other Kinds what?	
	Sq Yds	Miles	Sq Yds	Miles	Sq. Yds	Miles	Sq. Yds	Miles	Sq Yds	Miles	Sq Yds	Miles	Sq. Yds.	Miles	Sq Yds.	Miles	Sq. Yds.	Miles
Rochester, N.Y.	159,515	27.21	115,131	6.81		.071		2.657		1.58		5.61		.073		4.743		
Rockford, Ill.		1.39										1.85		.090		1.772		
Salt Lake, Utah	44,144	2.37					43627	2.31										
San Antonio, Tex	1455												53,795					
Schenectady, N.Y.		5.12				1.00		.050				1.80						
Scranton, Pa		1.232						1.70		2.16		0.96		0.02				
Somerville, Mass								2.40								7.000		
South Bend, Ind	56,000	2.00										3.00		6.00		2.000		*18.00
Spokane, Wash.	32,495										5,242					7.600		
Springfield, Mass	4,976	0.27					47,988	2.34		1.62	38,178					12.950		
Springfield, Mo.												3.50				.500		
St. Joseph, Mo.	200,000		3,500				1,000				120,000		6,000		1,300,000			
Syracuse, N.Y.	316,500	20.65	41,772	2.09			63,600	1.71			145,040	6.91			16,500	1.13		
Tacoma, Wash.	55,240	1.43									2,050	0.07	282,700	8.83				
Toledo, O.	377,018	20.48					488,625	25.58			596,944	33.31	271,762	15.45	12,422	1.654		*3.35
Topeka, Kan	194,000						122,000				94,000		38,000			1.00		
Trenton, N.J.	15,193				31,327		109,631				140,800				100,000			
Troy, N.Y.		4.90				0.18		1.690		3.50		7.10		0.07		4.20		
Utica, N.Y.	503,236	27.07					113,175	5.70	29,682	4.10	1,798	0.08			3,425	0.67		
Washington, D.C.	2,297,362	101.19	334,839	15.57	348,516	15.46	975,883	27.39	274,039	12.15	6,885	0.20			764,741	34.60		
Wheeling, W.Va.									101,099		308,131	17.31			183,209			
Wilkes-Barre, Pa		8.23						1.62		8.94		4.02		1.73				
Williamsport, Pa	44,464	1.69							35,575	0.28	65,435	2.68	18,155	0.72	10,805	0.73		
Wilmington, Del					8,840	0.50	180,290	1.060			182,870	10.90			229,600	16.90		
Woonsocket, R.I.	2,000															4.000		
Worcester, Mass				0.43				1.039		0.06		0.17						
York, Pa					29,241	1.00					30,626	2.00						
Totals																		

THE QUESTION DEPARTMENT.

[By Charles Carroll Brown, M. Am. Soc. C. E., for MUNICIPAL ENGINEERING.]

THE VALUE OF WATER-WORKS FRANCHISES.

We wish information in regard to the value of franchises, say, for twenty, thirty or fifty years. We understand there has been arbitration on such subject. Can you give us the result? Any information you can give us on the value of franchises we would be pleased to have.

The Salem Water Company,
By J. M. Wallace, Pres., Salem, Ore.

The subject of valuation of water-works property was discussed by the American Society of Civil Engineers, in 1897, and the papers and discussions will be found in the volume of the society transactions for December of that year. Kansas City and Syracuse are referred to in detail, but there is not much reference to the cash value of franchises, as in the former case, in particular, the franchise period was about to expire.

There are so many items for consideration in determining the value of a franchise that a definite answer to such a question is impossible. If the city is about to grant a franchise to a water company the considerations are quite different in practice than if an owner of a water plant is about to dispose of it to another private person or company. They are different again if the city is wishing to purchase from a company holding a franchise previously granted.

In the first case the length of time the franchise is to run, the control of the city over stock and bond issues and water rates, the kind of contract that is to be made for fire protection and water for public uses, the provisions for purchase by the city at fixed or indefinite times, are all important factors in fixing the amount the city should receive for the franchise. Annual payments of percentages of income or profits are now popular and usually more equitable than full payment of fixed sums.

In the second case many of the same items, the condition of the works, the earning capacity, the actual receipts and profits, the prospective growth, must be taken into consideration.

The third case is discussed most fully in the papers referred to above and an abstract can not well be given here.

In the case of the Syracuse Water Company referred to the company showed the total cost of the works to have been $900,000, the present value $852,775, the net revenue $70,000 a year, and the bonded debt $200,600. The commissioners estimated the present value of the plant at $391,030. The award of the commissioners paid by the city was $850,000. In Kansas City the franchise had expired and the city refused to renew it. In the former case, and to some extent in the latter, large expenditures by the city were necessary at once to put the works in condition to give satisfactory service. The Long Island Water Supply Company entered into a twenty-five-year contract to supply the town of New Lots with water. When the town was annexed to Brooklyn, the city wished to purchase and the commissioners appointed fixed the compensation at $77,500 for lands, $292,500 for all machinery, reservoir pipes and appurtenances (company's estimate, $334,951.91), and $200,000 for the franchise which still had about fifteen years to run. Total, $570,000. The receipts in 1892 were $84,295, and disbursements, not including interest and sinking fund charges, were $20,786.05. The business of the company was

rapidly increasing, but additions to supply would not be needed for some years. If all these items had been included the value of the property would have been increased materially. If the works had been sold to another company this would have been done.

There is room for so many differences of opinion in determining the value of a franchise that averages, made preferably by competent members of commissions appointed for the purpose, must usually be accepted as the best approximations possible.

LEGAL QUESTIONS RELATING TO SEALED PROPOSALS AND DEPOSITING CERTIFIED CHECKS.

Finding your magazine always so interesting and reliable, I take the liberty of asking you a few questions relative to contracts in a legal light. Municipal corporations in receiving bids usually insist on the bids being accompanied by a certified check or other deposit. (1) Can they legally refuse to accept a bid or ignore a bid not accompanied by such certified check? (2) Can they legally throw out a bid which is accompanied by a certified check of smaller value than that specified by the corporation? (3) After bids are received with certified checks attached, by the corporation, who is responsible to the bidders for their safe return? (4) And should one be cashed what could be done by the bidder to obtain a refunding of the money value of the deposit? (5) Is there any legal bearing on the opening and reading of the bids, as to whether they shall be read in public or private? (6) Again, can any action be taken in a case where the advertisement states, "Sealed bids will be received till 6 P. M. and opened at 8 P. M." and they are opened before 8 P. M. to faciliate tabulation, or anything else? (7) Also what can be done in case a bidder offers his bid after 6 P. M. before 8 P. M.? In the above case, is it safe for the corporation officials to take it? (8) Or is it safe for them to refuse it? (9) After the bids are opened can the corporation legally hold the certified checks till the contract is let? (10) And suppose the letting was deferred, how long could they hold them? (11) After the bids are opened, can the corporation hold the deposit of the contractor whose bid is accepted until his bond is put up? (12) And can they hold the deposits of the other bidders until this bond is put up, with the idea of accepting one of their bids in case the contractor fails to secure his bond? (13) If so, how long can they hold them on this plea? (14) In case the bidder who is awarded the contract fails to secure a bond, can the corporation confiscate his deposit, and claim it as the property of the corporation? (15) If a bidder wishes to reduce his bid after the bids are opened, can the other bidders prevent such reduced bid being accepted? or can any one of them or all of them take any other action in the case? (16) If a bidder finds when the bids are publicly read that he is much lower than the other bidders, can he forcibly recover his bid and deposit or save himself from being forced to accept the contract and fill it, under penalty of the loss of his deposit, setting up a claim of error in compiling his estimate? (17) Can he recover his bid and deposit by any other claim? (18) If a bidder can recover his bid and deposit as above, how can a corporation in receiving bids guard against loss of time, etc., consequent on such action on the part of contractors?

F. W. Salmon, Burlington, Iowa.

For any particular case, legal advice should be sought and would be based on the peculiar conditions existing, the customs of the locality and the laws of the state. There are some general principles upon which procedure in receiving bids should be based, and the following answers to the specific questions conform to the writer's observation of the usual customs where fair treatment is accorded all bidders. The principles of justice and honesty are frequently violated by boards and officials, often through ignorance, but sometimes on account of collusion with favored contractors. Recourse can always be had to the courts when injustice is done. Sometimes the complainant must be an aggrieved bidder, but more frequently he must be an interested tax or assessment payer. Advice as to the proper person to bring such suit must be secured for the particular case from competent legal authority. It is probable that some of the answers given will differ from those that would be given by some of our readers. If so, we shall hope to

receive statements of opinion as to the proper answers and the reasons therefor.

(1) In the advertisement for bids, or in the fixed rules for the government of the board in such matters, there should be a statement of the procedure that will be followed in receiving and opening bids, letting the contract and executing the same. These rules should be strictly adhered to, as they are a part of the basis on which bidders make their prices, and deviations therefrom are almost sure to work injury to some one. The requirement of a certified check to be deposited with the bid is one to save the corporation from the expense and damage from delay of re-advertising the work, if the accepted bidder fails to enter into contract, and is intended to be retained to reimburse the city for such damage and expense, on account of such failure. The corporation can therefore legally refuse to accept a bid not accompanied by the check required in the advertisement for bids, or by the rules of the board.

(2) The amount of the check should be that so required, or the board can reject the bid. These rejections should be made as soon as the defect is discovered and before reading the bids.

(3) The checks are held in trust for the bidders and the corporation by the officer named to receive them and are subject to the orders of the board until all the conditions of the advertisement and board rules are complied with, when they become the property of the bidders or of the corporation according to whether the bidders have individually complied with the conditions of the letting or not and to the decision of the board in the latter case. The officer named, the clerk of the board, or the members of the board, are responsible for the safe return of the checks, according to the terms of the advertisement and the rules of the board.

(4) Should such checks be cashed without due authority of law the responsible officer may be proceeded against for misuse of trust funds and can readily become liable to criminal prosecution.

(5) The usual requirement of advertisement and board rules is that the bids shall be opened and read in public. Any other mode of procedure is open to the suspicion of dishonest manipulation. The matter is probably one within the power of the board to determine, and unless the advertisement for bids or the fixed rules of the board require public opening and reading of bids the board can probably open the bids in private. It should be easy to arouse such an expression of public opinion that a board would find itself obliged to make rules requiring open consideration of bids except in cases where premature publication of figures would be to the serious detriment of the corporation. Such cases are, of course, extremely rare.

(6) The terms of the advertisement and rules should be followed strictly, and if bids are opened subsequently to the limit set for receiving them, and prior to the time set for opening and reading them, the procedure should be definitely fixed by rule, and the bids should be opened by trusted and trusty officers of the board, and the figures not disclosed until read in the board meeting at the time fixed. This method has its conveniences, but always lays the employes of the board having the tabulation in charge open to suspicion of undue influence in securing pre-

mature disclosure of prices. If the rules are strictly adhered to this amounts to little.

(7) If bids are opened for tabulation as just described, before the hour set for reading bids, no bid should be received after the time set as the limit for receiving bids. There can then be no suspicion of collusion with the late bidder in furnishing information regarding figures of other bidders. If the bids are not opened until the time set for reading them, there can be no harm in admitting a late bidder if the board *and all the other bidders* consent. In such cases the time-limit for receipt of bids should be the time of opening bids, and no bids should be received after any bid has been opened.

(8) The board can legally refuse to accept a bid filed after the time-limit has expired, and should refuse all bids so filed.

(9) The rules should state the length of time checks can be held. The check of the successful bidder must be held until he complies with the conditions, or until it is forfeited by his non-compliance. Unless specific directions are given in the advertisement or rules, the checks of bidders not awarded the contract are considered to revert to their owners and to be subject to their call, at once, if desired. Should it be desired to retain the checks so that the contract could be let to the next bidder in case the one to whom the contract is first awarded fails to qualify, it should be so stated in advertisement or rules. If not so stated the arrangement can be made afterwards with the bidders, but they usually have the right to withdraw check and right to receive the contract unless such special agreement is made, verbally or otherwise. The check is supposed to pay the damages and expense of another advertisement, but can probably be used to pay the additional expense incurred in letting to the next lowest bidder in case its owner (the lowest bidder) fails to enter into the contract.

(10) If the letting is deferred any bidder can probably demand the return of his check, but he at the same time loses his chance to obtain the contract. This is frequently a question of damage to bidders which must be settled upon the merits of the particular case. If it is considerable and the board is unreasonable, recourse must be had to the courts. Strictly speaking, the board can not defer the letting except by consent of the bidders, and can not usually retain the bids or checks of those unwilling to wait.

(11) This is the purpose of the check, and if the bond is not filed within the time specified and the contract is not signed, the board can, and should, apply the check of the delinquent contractor to the benefit of the city.

(12) If the bidders are willing. This answer is included in 9 above.

(13) As long as the bidders are willing, unless specifically provided for in advertisement or rules. See 9 and 10 above.

(14) The check is required for the purpose of reimbursing the city for any damage or expense on account of failure of successful bidder to enter into contract, and forfeiture of check upon such failure is agreed to by him in filing it with his bid. The board not only can, but should, declare the check forfeited to the city. Boards are too apt to be lenient to delinquent contractors in this matter, frequently to the serious detriment of the corporation's interests.

(15) All the principles of fairness are violated by any permission

to change bids after they are opened, and many dishonest contracts are let in this way, the favored contractor being permitted to reduce his bid to the lowest, and afterward enabled to make his profit by violations of specifications, allowance of extras, payments for work not done, etc. If the board persists in permitting this, no taxpayer has a cause of complaint which would be heard in court, unless he can show fraud, because the cost of the improvement is reduced. Whether a bidder would have a cause of action must be determined on consideration of the circumstances in the particular case, the laws and court decisions in the state in which it occurs.

(16) If the bidder can establish his claim of serious error, he will usually find the board willing to cancel his bid and return his check. Some boards are so careful in their modes of procedure that they will require the bidder to establish his claim of error in court in a suit to recover his check or otherwise. Courts usually decide in favor of the bidder if his claim of material error is substantiated, unless there are peculiar circumstances requiring a different decision.

(17) By any claim which he can convince the board is just, or which he can substantiate in court in suit to recover his check.

(18) If the claim of 16 or 17 is established the bid is cancelled and considered as though never made, so that the contract would be awarded to the lowest actual bidder and his action and check would be those of interest to the corporation. The question of loss to the corporation must be considered in deciding to cancel the bid, and the board must take into account the probable decision of the court in a suit by the bidder to recover his check. If his error causes loss to the corporation the board should be able to secure a settlement which will reduce this loss to a minimum. Most boards are too lenient with contractors in such cases.

COST OF STREET SPRINKLING AND SWEEPING.

In your June number, '99, on page 384, you give the figures of street cleaning of different cities of this country. Are these figures for complete work, namely, sprinkling prior to sweeping, sweeping, picking up the sweepings and carting them to the dump, or are they for sweeping alone?
B. Kern, Jr., Toledo, Ohio.

The figures given are for the work complete, including whatever sprinkling is necessary and the disposal of the sweepings. The figures for sprinkling are for street sprinkling without reference to sweeping, and the cost is probably higher than that of sprinkling preliminary to sweeping.

RELATIVE MERITS OF SHALE AND FIRE BRICK FOR STREET PAVING.

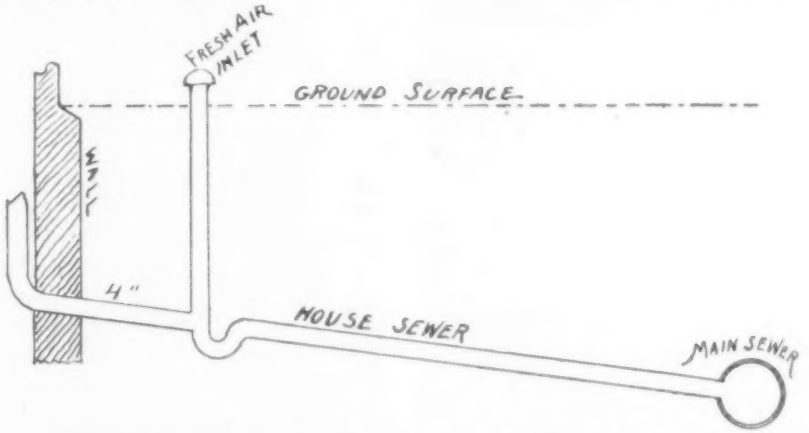
I am looking up the question of shale brick vs. fire brick for paving purposes. Could you favor me with the results of past experiences, and also give me references, particularly to late discussions of this question? *A. B., Pittsburg, Pa.*

For full discussions of the subject one should go back to the literature of three to five years ago. The whole matter was thoroughly gone over at that time and the scarcity of pure fire clay, according to the technical definitions, with the general application of the term shale to nearly all deposits suitable for making paving brick has reduced the proportion of true fire brick used for paving to a very small figure. The difficulty of naming a fire clay is shown in a discussion on the subject in MUNICIPAL ENGINEERING for January, 1896, page 23. Other discussions of the subject appear about that date and earlier. Undoubtedly there are

some fire clay brick which make better pavements than many shale brick. Tests of particular manufacturers' product in the street are the best evidence regarding its durability. Next to these are the elaborate mechanical tests now prescribed. The question is not now between fire clay and shale as materials for making paving brick, but between brick of various makes and materials, as to which is the most durable. In fact, most of the best brick are made of a judicious mixture of shale and clay.

STANDARD SANITARY PRACTICE REGARDING SEWER VENTILATION.

Will you please answer through your magazine if it is not the recognized sanitary practice all over the United States and Europe to tray the main sewer and have a fresh air inlet thus:



We are having quite a discussion here about it amongst the plumbers, some favoring the trap and fresh air inlet, and some contending that there should be no trap, but the main street sewer should be vented through all the houses. Our system of sewers here is what is called the separate system. Will you please state what is the universally recognized rule in modern sanitary practice in regard to this question?

E. G. Trueheart, City Engineer,
San Antonio, Tex.

The construction described has long been standard and required by the health department of the city of New York. There is good reason for it when plumbing inspection is not thorough, and where "combined" sewers are used, especially if their construction has been imperfect and deposits occur. Modern practice has been removing all these objections to omitting the trap in the house sewer, and many arguments in favor of a free passage of air from sewer to roof through soil pipes, are now presented. The use of the trap in the house drain in a separate system of sewers is to a certain extent a confession that the sewers are not properly designed or built, and not properly and frequently flushed. A well designed and constructed system for house drainage only gives no opportunity for deposits of decomposing material, except in the smallest branches, and flush tanks discharging at frequent intervals supplies of water proportionate to the work required, will keep these clean. The sewage is then removed so promptly that almost no "sewer gas" is formed and odors are very slight. Full provision for ventilation through manhole, flush tanks and lamp-hole covers, and through house connections will keep the sewer air sweeter than that of many ill-ventilated crowded assembly rooms.

Plumbing must be properly designed and tested in the most thorough manner to prevent accidental admission of occasional accumulation of sewer gas when the sewers are permitted to get out of order. Such occasional admissions are in any case no more dangerous, and scarcely more objectionable than a constant admission of the products of decomposition in the house system itself, even if the trap is inserted outside the house. If the air always flowed in at the inlet as proposed there would be dilution of gases thus formed, but this can not be depended upon at all times without special provision for forcing the draft.

Thus, while there is weight of old authority and municipal regulation on the side of the trap in house drain on systems of large, poorly-constructed old sewers, there is much weight of scientific theory and successful practice in favor of omitting the trap on house drains in new well-designed and constructed sewers on the separate system. There is no universally recognized rule on the subject, although the insertion of the trap is by far the most common, but there is frequent controversy such as is suggested in the question. As is usually the case, where there are such differences in practice, the true mode of procedure must be worked out for the individual conditions. The important thing in the case described is not the insertion or omission of the pipe, but the thorough inspection of the house plumbing by competent municipal authority, and this inspection should be made at regular intervals. Simple inspection of the first plumbing put into the house does not warrant one in assuming that future additions or repairs are properly made.

(By J. W. Howard, B. L. C. E., for MUNICIPAL ENGINEERING.)

SAND FOR ASPHALT OR OTHER SIDEWALK MIXTURES.

I send you two samples of sand secured from a crusher, one of which is washed. Are they good for asphalt or other sidewalks? Asphalt sidewalks have been laid in Halifax for four years. Some are not lasting well. A difference of opinion exists about the proper grade of sand or gravel to use. *X., Halifax, N. S.*

Screenings from crushers are seldom good for mixing with hydraulic cement for sidewalks. Special fine screenings, freed from dust by washing, are excellent for making fine cement concrete for the surface of cement sidewalks, areas, etc.

It is seldom that any product of a crusher can be used to mix with refined asphaltum or asphaltic cement (a special bituminous preparation) for the surface mixture of asphalt pavements or sidewalks. But experienced men could well use your sharp, clean, washed, fine stone, which is almost a sand. But they should add very fine sand—about one-tenth of its bulk to your product; also about one-twentieth of a powdered silica or a limestone to fill voids. The climate extremes of Halifax demand a solid foundation, so deep and well drained as to resist frost. On this foundation you should use an asphalt surface mixture, rich enough in asphaltum or natural mineral pitch to prevent cracking from sudden chilling in very cold weather. Avoid coal or gas-tars, which are not asphalts, in your surface mixtures.

If you are using European asphalt mastic sidewalks, your washed sand scrubbings are excellent for that mixture and should be added to the melted mastic cakes and Trinidad or other real asphaltum in the mixing kettles.

Gravel must be avoided in all surface mixtures, because it is not angular and is not held tightly in the pavement or walk.

HORSELESS CARRIAGES, KINDS, COST, ETC.

What is the cost of a light horseless carriage? By what power are they driven? At what cost for power?

W. L. Bishop, Dartmouth, N. S.

The cost ranges from about $450 to $2,500, according to the kind of power, size and style of a carriage for two persons. Some for two will carry four on good roads. The motive powers in use and under experiment are naphtha, gasoline, petroleum, steam with naphtha for fuel, electric storage batteries, compressed air, carbonic acid gas, etc. Cost of running is a little less than ½ cent per mile per person, but repairs, cleaning, housing, etc., must be added. Remember that perfectly successful carriages are hard to find, but are soon expected.

INJURY TO WATER PIPES BY ESCAPING ELECTRIC CURRENTS.

What is the Atlanta ordinance against injury to pipes from escaping electricity from trolley or other electric currents? Where can I get a copy of that ordinance?

A. L. S., New Orleans.

You can get a full copy by writing to the city clerk of Atlanta. It is brief, covering only about one small printed page. Its principal points are: (1) All producers and owners of electricity must use appliances to retain it within its proper channels and not allow any to escape and injure any pipes or other structure or property of the city; also keep all such electric appliances in good order and use improvements thereon. (2) Penalty for each violation $100. It is not necessary to show that the whole of any injurious electric current comes from any one source; each contributor to the injury shall be fined. (3) The city may collect damages in addition to each and every fine imposed.

IS ALUMINUM GOOD FOR WATER PIPES?

Would aluminum be a good material for water-service pipes? What are the objections to its use?

W. L. Bishop, Dartmouth, N. S.

It would be good from receiving stand-points, but it is not pliable like lead pipe for making house connections, nor is it yet as cheap bulk for bulk, that is, on a basis of the same size and length.

RE-USE OF OLD ASPHALT.

Can you inform me if there is any literature relating to the re-use of old asphalt material with fresh asphalt to make the new mixture for paving purposes, and if so, where the same can be obtained? Have any articles on the subject been published in MUNICIPAL ENGINEERING?

Levan H. Campbell, Examiner, Div. 15, U. S. Patent Office, Washington, D. C.

Articles have been published from time to time in MUNICIPAL ENGINEERING on the subject of the re-use of asphalt in connection with fresh material. Some of the articles to which reference can be made will be found on page 115, No. 2, Vol. X, February, 1896; page 359, No. 6, Vol. XI, December, 1896; page 377, No. 6, Vol. XII, June, 1897.

USE OF TEMPLATES IN ASPHALT PAVING.

I notice you give a good deal of attention to asphalt paving, and would like a little information. Would a successful template for asphalt paving be in demand? How much labor would it save, and would it improve the uniformity of the paving as to thickness and conformity to grade? I believe that it would do all this, but do not care to advance any ideas or theories regarding something I am not too well acquainted with.

W. R. Smythe, Madison, S. D.

Many forms of templates and gauges for regulating the depth of the asphalt paving mixture on the

concrete or other foundation have been proposed and tried. Few, if any, are now used by asphalt paving companies and contractors. The varying width and crown of streets and parts of the same streets have taught paving companies to be very careful and finish the concrete, or other foundation, to a surface parallel in every respect, or almost so, to the final surface of the pavement desired. This is done by means of a row of stakes in the center of a street, and two other rows half way between this row and the curbstones. In case of very wide streets additional rows are driven. The stakes are in line both lengthwise and crosswise the streets and their tops are left at the exact heights needed and determined by means of three special "T" squares, which by being inverted and having wooden blocks or lines upon them, are used to sight crosswise and lengthwise the street in setting the stakes.

When the foundation is finished, the thickness of the asphalt pavement surface, when raked with hot iron rakes, is determined by the length of the teeth of the rakes specially made for this purpose. The thickness before compression to that after compression is about as 3 to 2. For a long time raking gauges were tried. These consisted in an iron bar about ⅝ inch diameter, mounted on four pair of short legs. This bar was laid lengthwise the street, in the center, but the trained raker can do more and better work without it. It is customary to use two chalk lines on the face of the curbstones on each side of the street. The upper line is called the "raking line," to which the loose material is raked. The second line is the "tamping" or "compression" line. Straightedges of wood eighteen or twenty feet long are used to be sure the gutters are finished in straight lines lengthwise the street. The straightedges are also used at other places lengthwise the street.

On the whole, we think there is no demand for any form of template, except as used on large, flat areas of market places, floors, etc., where planks of the thickness of the finished pavement are wet with a little residuum oil and laid end to end as a side guide along which to finish a strip of pavement. They are then removed and placed for laying a second strip. This is for surfaces so wide that asphalt can not be laid across the entire surface and lengthwise simultaneously. The hand and steam rollers should be used over these side strips freely. The problem of laying asphalt pavements is not similar to that of Portland cement or other pavement, which is laid moist and hardens by drying and setting. The asphalt pavement hardens by compression and cooling, hence the difficulty of using forms and templates.

LEGAL DECISIONS.

[Reviewed Specially for MUNICIPAL ENGINEERING.]

SPECIAL ASSESSMENTS—PRIMARY LIABILITY OF CITY ON CONTRACTS FOR IMPROVEMENTS PAID THEREBY.

Two important decisions have recently been handed down affirming the general doctrine that a city can not be held primarily liable on contracts for improvements to be paid from special assessments, in case the statutes under which the contract is made expressly forbid the assumption of such a liability by the municipality.

The first of these decisions, City of

Huntington *v.* Force, was handed down by the supreme court of Indiana, April 4, 1899 (53 N. E. Rep. 443). Here it was held that, under the law of March 8, 1889, known as the "Barrett Law," providing that the city shall be liable for the price of public improvements, and that the cost thereof shall be assessed against the land benefited, a city is not liable for such cost until it has, in some way, realized from the property benefited the amount thereof. The appellees in this case sued the city of Huntington for moneys alleged to be due to them on account of work and materials furnished in the construction of certain public sewers, which constituted a part of the general system of public improvements of the city, the contracts for their construction being entered into under the authority of the law cited, and the action being brought against the city as if it were primarily and unconditionaly liable. The statute required that the cost of the improvements should be assessed against the lots and lands benefited thereby, and permitted the issuing of bonds in anticipation of assessments against the property so benefited; but it did not require or authorize the city to pay the cost of the improvements out of its general revenues. As it was not shown that the improvement bonds had been sold, or that a fund had come into the possession of the city out of which the claims could be paid, the court could not well hold otherwise than that the liability of the city under the action was not established.

A second case, bearing upon the application of the Illinois statute is that of the City of Pontiac v. Talbot Paving Company, the decision in which was handed down by the circuit court of appeals, seventh circuit, on May 19 (94 Fed. Rep. 65). The alleged cause of action was the failure and neglect on the part of the municipal authorities to provide "for a new special tax assessment" against contiguous property to pay amounts earned under a contract for the paving and improving of certain streets entered into by the city under the authority of and in accordance with the general incorporation act for cities and villages. Section 49 of article 9 of the said act (1 Starr & C. Ann. St. Ill., 2d ed., p. 777) declares that "all persons taking any contract with the city or village, and who agree to be paid from special assessments, shall have no claim or lien upon the city or village in any event, except from the collection of the special assessment made for the work contracted for." After the work had been performed and accepted by the city and part payment made therefor, in an action brought by certain lot owners and prosecuted by appeal to the supreme court of the state, it was decided that the ordinance under which the contract was made was invalid, because of a power given to the city engineer to make alterations in the specifications and to vary the contract price. (Bradford *v.* City of Pontiac, 165 Ill. 612). Consequently it became impossible to collect the special tax, and the city council refused to make provision for the payment of the amount due. The present action was brought on the ground of such willful refusal and negligence on the part of the city officers to provide for the payment of the sum due.

The court in its opinion says: "The statute which confers the authority for making the improvement in question imperatively requires that the expense, aside from street intersections, shall be borne

by the abutting property, through special assessment, and shall not become a public charge 'in any event.' The provision is of general application to cities and villages in the state of Illinois, and is in accord with a rule of public policy which is common in municipal charters, and is upheld by judicial authority. If, however, the contractor, who performs the work so authorized, has the right to recover the contract price against the municipality, by way of damages, in the event of neglect or refusal on the part of the public officers to perform their duty in enforcing the special assessments, the way is clearly open to evade and nullify the legislative purpose. However, the consensus or weight of authority shall ultimately determine the remedy of the contractor for local improvements, where the statute authorizes payment by special assessment, but is merely directory in its terms to that end, or where the collection is limited by ordinance or contract to such assessments, and the authorities fail to provide for or carry out the assessment, we are clearly of the opinion that no general doctrine of municipal liability for mere nonfeasance in the failure or neglect of council or officers to perform a duty of the municipality can be extended to override *per se* the inhibitions expressed in this statute."

The decisions in support of this view are well considered and apparently without conflict, and the following are leading and pertinent examples: Fletcher *v.* City of Oshkosh, 18 Wis. 228; City of Greencastle *v.* Allen, 43 Ind. 347; Goodrich *v.* City of Detroit, 12 Mich. 279; Reock *v.* Mayor of Newark, 33 N. J. Law 129; People *v.* City of Syracuse, 144 N. Y. 63.

CITY ESTOPPED TO DENY THE LEGALITY OF A CONTRACT WHICH IS SEPARABLE AND UNDER WHICH THE CITY HAS RECEIVED BENEFITS.

The city of Dawson, Ga., made a contract for a water supply for twenty years, but failed to obtain the authority of a vote of the citizens, as required by the constitution. The company complied with its part of the contract and erected a plant at great expense in order to furnish water to the city. As the city council had the right to make a contract to supply the city with water for one year, when there was money in the treasury sufficient to pay therefor which might be lawfully appropriated, or the sum could have been raised by lawful taxation levied during the year, the court held that upon the compliance of the company in furnishing the water, the city is liable for the amount stipulated in the contract for each year that it received the benefits thereof. (City Council v. Dawson Water-works Co., 32 S. E. Rep. 907.)

ASSESSMENTS ACCORDING TO BENEFITS.

The Massachusetts court lays down the rule, in the case of Sears *v.* Street Commissioners of Boston, that local assessments on particular estates are permissible in that state only when founded on special and peculiar benefits, and then only to an amount not exceeding such benefits. (53 N. E. Rep. 876). This is the rule that prevails in many of our states and which has recently been laid down by the supreme court of the United States as applicable by the federal courts under the clause of the constitution of Ohio which forbids the taking of private property for public use

without just compensation. (Norwood *v.* Baker, 172 U. S. 269.)

WHO MAY ENJOIN THE CONSUMMATION OF AN INVALID CONTRACT.

Any taxpayer may sue to enjoin the consummation of a contract for city work awarded in violation of a statute and ordinance, requiring it to be let to the lowest bidder, though he is such bidder. The refusal in this case to let the contract to the lowest bidder was due to an agreement among the members of the council not to let the contract to the employer of non-union labor. (Holden v. City of Alton, 53 N. E. Rep. 556.)

CONSTRUCTION OF WATER CONTRACT.

Under a contract by a city with a water company by which the latter was to furnish and keep in order 15 fire hydrants for a period of ten years at an annual rental value of $112 per annum, the city to have the right at any time within the ten years "to take any additional number of fire hydrants at an annual rental of one hundred dollars each," the city ordering additional hydrants is liable for their rent for the remainder of the period of ten years and not merely till the order is rescinded. (State *v.* City of Phillipsburg, Montana Supreme Court, 57 P. Rep. 405.)

CONSTITUTIONALITY OF SPECIAL ASSESSMENTS.

The supreme court of California has recently passed again upon the constitutionality of the special assessment act in that state in the case of Cohen *v.* City of Alameda (57 Pac. Rep. 377). Although the act had been fully considered and upheld by the court in Davies *v.* City of Los Angeles, 86 Cal. 37, the appellants cited Norwood *v.* Baker as directly affecting its constitutionality. The court points out that the two cases are not analogous; that in the present case the commissioners appointed to make the assessment reported that their assessment upon the lands within the district had been made by them in proportion to the benefit to be derived from the improvement, and this report and assessment was afterward confirmed by the city council, without any objection thereto so far as appeared from the record.

SPECIAL ASSESSMENTS FOR PUBLIC IMPROVEMENTS.

The question of taxation for public improvements by special assessment against the property supposed to be benefited is again brought under discussion through the decisions of the federal courts, based on the case of Norwood *v.* Baker, to the effect that such special assessments must be according to the benefits accruing to the property so taxed. While undoubtedly this method has been necessary for meeting the rapidly developing needs of our cities, it is true that in many cases through defective legislation many abuses have grown up in some of our states and that often gross injustice has been done to the property-owner. Not only have the assessments been in excess of the benefits in many instances, but personal judgments in some cases have been sustained for such assessments. In our next issue, the question of the effect of the federal rule upon the procedure in special assessments will be discussed and the recent cases reviewed.

COMMENT ON CURRENT TOPICS.

The Septic Tank.

Some additional results of the operation of the small septic tanks at Champaign, Ill., designed by Professor A. N. Talbott and operated under his direction, are now available and extend the evidence that the process can be compared very favorably with that of chemical precipitation so far as results are concerned. The expense of operation is very materially less than the cost of the chemical process, because no chemicals are required; the labor of operating the plant is almost nothing and the amount of sludge to be disposed of is less than one-fifth that produced by chemical precipitation.

It is true that the effluent is far from being pure water, but this is true also of the chemical process, so that the comparison between the two must be made on the basis of the results actually obtained. Judged by this standard, the septic tank is a material improvement over the chemical precipitation tank, especially in daily cost of operation. This fact will enable many small cities and villages to avail themselves of the advantages of sewers, which have heretofore been deterred by the fact that the raw sewage would produce a serious nuisance, which they have not felt financially able to prevent by adding sewage-disposal works to the proposed system. There are many such towns in the West whose only outlet is a small stream or watercourse, possbily dry during several months of the year, for whom the purification secured by the septic tank is quite sufficient, since no water supply is within reach of contamination and the effluent is sufficiently clean to prevent any fear of nuisance from decomposition of the organic matter still remaining in it.

In those districts there are other towns where more thorough purification is necessary, and they are deterred from undertaking the improvement by the fact that the area available is not suitable for land filtration and by the prohibitive cost of importing materials for filter beds. The effluent from the septic tanks like that from chemical precipitation tanks can be still further purified by such filtration in much smaller beds and on somewhat less favorable material, and their introduction will thus bring about a further reduction in first cost and in maintenance expenses where thorough purification is demanded.

This statement is made notwithstanding the report that Brockton, Mass., has found the disposal of sludge and the care of filter beds but slightly reduced by using a sewage reservoir as a septic tank. A considerable nuisance was also developed from the bad odors of the decaying sludge. These facts are so at variance with those regarding true septic tanks that an explanation must be sought, and will be found in the lack of adaptability of the reservoir to the septic tank process. The failure to distribute the flow horizontally and vertically, the admission of too

much air and light, too long retention in the tank, will account for all the troubles mentioned. There have been sewage reservoirs in use for many years which have seldom shown any evidence of satisfactory action in disposing of sludge by bacterial action, and while some of the conditions in the Brockton reservoir are favorable, most of them do not conform with the designs for septic tanks which have secured satisfactory results. Favorable reports could, therefore, not be expected from an attempt to use a reservoir as a septic tank without any adaptation to the demands of the new method.

Conditions differ widely in cities and villages, and each problem must be studied for itself, but the new method opens up a comparatively cheap manner of securing satisfactory results for many corporations in nearly all sections of the country.

Permanent Census Bureau.

One of the recommendations of the committee on municipal data of the A. S. M. I. is for a permanent census bureau, which shall have charge of the collection and collation of statistics. So far as the actual count of heads every ten years is concerned there is no serious need for such a bureau, nor for many of the general items in the statistical tables. Some superintendents of the census have, however, had larger ideas of the possibilities of a census and have attempted elaborate schemes for various special inquiries which depended for their value upon the accuracy with which the data were gathered, and the expertness with which they were collated and the summations and conclusions were drawn. Many of these special inquiries have failed to produce results at all commensurate with the cost and labor of making them, and those which are probably erroneous have tended to cast doubt upon really good work done by the enumerators on simpler lines. The reason for these failures can readily be seen. The compilers of the tabular forms were of necessity with slight practical experience in such work, and in many cases, while quite expert in theory, were not sufficiently acquainted with the various forms of practice in keeping records to produce tabular forms which could be filled out in the desired detail by the persons to whom they were presented. The enumerators were still less experienced and if they made efforts to assist in filling the blanks were liable to make them in wrong directions. Each census is taken by almost an entire new set of employes, from superintendent down, and thus the errors of one census may be repeated in the next. The demand for greater simplicity in the great census under present methods of management is therefore based on the best of grounds.

Many departments of the government, and many officials, state, county and municipal, as well as many students of economic questions, are desirous of securing in-

formation of various kinds, and much stationery, printing, postage and time of investigator and of officials and private individuals is wasted in getting out forms and distributing them, in pushing correspondents to reply and in getting information in shape to answer the thousand and one questions, wise and otherwise, which are asked in such forms and letters. The American government official is long-suffering, and is accommodating in the extreme, or we would not have the numerous valuable collections of data and deductions therefrom which appear in public, society and private publications from time to time, incomplete though the information may be. Of course there is a vast amount of duplication in all this—enough to go a long way toward maintaining a reasonably satisfactory bureau to whom those wanting information could go for data and for instruction as to how to use them. Congress frequently calls for elaborate investigations, and there is much duplication in this work. There is still more in the work of the departments, some fields belonging legitimately to more than one, and being cultivated, even at the same time, by more than one. Evidently there is much needless expense incurred in these duplications, which could add still more to the fund for maintaining the permanent bureau. Even if all the savings added together did not equal the cost of the bureau, the convenience of securing information, the added value thereof on account of increase in volume and accuracy, as well as in adequacy of plan for collecting and disseminating, would be worth a large additional sum.

The reasons for desiring a permanent census bureau are thus seen to be numerous. Continuous employment of experts under direction of permanent chiefs of departments, and consequent vast increase in value of data are the first to mention, but the saving in public and individual time and money come close behind.

In the field of public works alone, when considered in all its lines, there is ample reason for the establishment of such a bureau. Whether the scope of the bureau shall be such that it can make the periodic enlargement necessary to make the count of population and the collection of general statistics once in five or ten years is a matter of detail which can be determined upon grounds of expediency. If it does not take charge of this work it should at least determine the scope and form of the inquiries to be made in addition to the merest numerical record of the population and its occupation.

The A. S. M. I. began the move in this direction among the organizations of men in public or semi-public employment, in consequence of a portion of the annual address of President Herrmann, two years ago, and is preparing through its committees some recommendations upon the subject of municipal data. The Am. Soc. C. E. has re-

cently appointed a committee to urge upon the census authorities the importance of collecting comprehensive data upon municipal operations of all sorts. If other societies will join with these two in the agitation some tangible result will be certain. The influence of these two will be certain to secure some of the action desired.

Danger from Lead Pipes. A report of poisoning from lead pipes used to convey driven-well water comes from Lowell, Mass. This is not a frequent occurrence, as most ground water contains substances which do form insoluble compounds with the lead of the pipes or a closely adhering coating preventing chemical action. In this case the trouble seems to be caused by carbonic acid in the water which has time to react upon the lead of the pipes in long lines or where the water stands for some minutes. Similar effects would doubtless be observed in pipes of other materials ordinarily used to convey water, except tin-lined lead pipes and asphalt or cement-lined iron pipes thoroughly well covered. Lead is the only material which makes the water actively poisonous, though the zinc from galvanized iron pipes might make it objectionable for use.

This experience suggests the great desirability of tests to determine the contents of underground water, gaseous as well as liquid and solid, before the kind of material to be used in service pipes is selected. Luckily there are few instances of the occurrence of chemicals having detrimental action on any of the common materials except where mineral waters are found, in which cases the chemical properties are carefully determined and care is taken with the methods of distribution in the restricted area served by the well or spring.

Good Roads. The Good Roads Association, formed in St. Louis last fall, is doing good work in arousing an interest in the methods of expenditure of public funds for road construction and repairs, and in the study of the question of the proper materials and methods of construction for roads. A series of twelve conventions has been arranged for the month of September in Illinois alone, closing with a state convention September 26, at Springfield. Prominent advocates of good roads and officials from the United States Bureau of Road Inquiry, are promised as speakers, and the manufacturers of road machinery and materials will be on hand to show what can be done with their apparatus. The prairie states are much in need of this agitation. The local materials for the construction of roads are so poor and hard roads are therefore so expensive that more work is necessary to demonstrate their economy than where the materials are so readily attainable that sample sections of road were made long ago, and followed by general improvements of all roads. Luckily the value of much of the

land in such a state as Illinois is now so high, and the saving to the farmer by good roads is so easily demonstrated, that the case is very hopeful and a very few years of thorough discussion will inaugurate the system of improvement of roads which is the next advance to be made.

Similar series of conventions have been arranged for Wisconsin, Iowa, and Minnesota.

Abolition of Water rates. The circuit courts of Michigan have decided that the partial abolition of water rates in Detroit is unconstitutional, on technical grounds involving the method of making the decisions required, and without reference to the merits of the actual question. If the supreme court affirms this decision the voters of the city will have an opportunity to review the matter and decide whether the principle upon which free water is based is a proper one.

Water has long been considered in this country to be as free as air, and the present wanton waste in the cities arises from this feeling. Citizens who have come to us from foreign countries and know the difference in circumstances there are loth to get to those conditions in their adopted homes and support the attempts to continue the present conditions here. The only other ground upon which any attempt to justify free water is based, is that public health and well being demand that for certain domestic purposes the use of water should be as free as the use of sewers. The two uses are, however, materially different. There are other methods of getting water than from the city supply. Large portions of some cities resort to rain-water cisterns when the city supply is not satisfactory.

But there is only one sanitary method of disposing of the polluted water in a large city, that is practicable under American conditions. Then, too, when the sewer is constructed its expense practically ceases. Up to the limit of its capacity it requires little additional expense and is ready for use at all times. The corresponding expense in the water supply system is for the construction of the pipe system. This cost should be assessed in the same manner as that of sewers. But when the pipes are laid the great expense begins. Water must be forced at high pressure through the pipes constantly. This constant expense must be met by the whole city if all are consumers of water, but it must be equitably distributed. If A wantonly wastes water, under a system of free water, every tax-payer in the city must help pay for his misdeeds. The tax is paid by the whole city, if it is assessed upon the property using it directly, just as much as if it is raised by general levy.

An opportunity is afforded by the method of direct assessment to make the waster of water pay for his privilege and to give the careful citizen who uses water only according to his needs the benefit of his

meritorious action. A minimum rate fixed to pay for an ample supply for all legitimate household purposes will take away the miser's excuse for not using enough water to keep his premises in sanitary condition. This method of assessment of water rates tends to reduce the consumption of water to a reasonable and legitimate figure, one which is not reached in any city of this country. Free water for domestic purposes tends on the other hand to enormous waste and will enormously increase the expenditures for supplying water. The extension of the use of water to all dwellings will not be fostered to any great extent. The first cost of putting in the supply pipes is what deters the small property owner from using the water freely, not the small bills for one or two connections.

It is understood that the plan does not propose free water for all purposes. Sometimes a city will donate water to a factory to induce its location, but this is done just as a money grant is sometimes made, and as other taxes are rebated, because the city expects to reap the benefit in general taxes. Free water for manufacturing purposes would be taxing the many for the benefit of the few with a vengeance. Unmetered services for manufacturing purposes are producing the same result.

CURRENT INFORMATION.

Meeting of the American Society of Municipal Improvements.

The sixth annual convention of the American Society of Municipal Improvements will be held in the city of Toronto, Canada, Oct. 3, 4 and 5. A special rate of a fare and a third for the round trip has been secured. The society is composed of officials of about a hundred of the leading cities. It is conducted on a high plane, and through investigations conducted on behalf of the society valuable contributions have been made to knowledge of subjects pertaining to municipal affairs. The cost of membership is merely nominal, being $5 per annum for each city. A large attendance at the meeting is expected, and arrangements are being made which will assure a pleasant and interesting visit for those who go to Toronto. The different standing committees will submit reports on their investigations during the year, to be followed by papers by men of prominence in the practical work of municipal management. The program has not yet been completed, but will be sent out in a few days. In connection with the report on street paving a paper will be read by Mr. Gomer Jones, city engineer of Geneva, N. Y., on his method of making abrasion tests of vitrified brick, and Mr. Geo. W. Tillson, one of the engineers of Brooklyn, N. Y., will present a paper on "The Relative Life and Ultimate Economy of Different Paving Materials." The committee on taxation and assessment, through Mr. Aug. Herrmann, chairman, will present some more statistics, which will form a valuable addition to the excellent report of that committee last year. Mr. F. W. Cappelen of Minneapolis has in preparation a report on city government and legislation. A recent letter from Mr. Cappelen indicates that he will have something important to present. Mr. C. C. Brown, chairman of the committee on Municipal Data, has gathered much information during the year as a basis for a report supplemental to the one submitted last year. Mr. Harold P. Brown will present further details as to electrolysis in Dayton, O., and some notes on the situation in Brooklyn will be submitted by Mr. Nelson P. Lewis, the president of the society.

The present officers of the society are: President, Nelson P. Lewis, Brooklyn, N. Y.; First Vice-President, A. D. Thompson, C. E., Peoria, Ill.; Second Vice-President, P. H. Thomas, Parkersburg, W. Va.; Third Vice-President, B. H. Colby, St. Louis, Mo.; Secretary, D. L. Fulton, Allegheny, Pa.;

Treasurer, John L. Kennedy, Nashville, Tenn.; Finance Committee, F. J. O'Brien, Oswega, N. Y.; T. A. Twamley, Grand Rapids, Mich.; G. F. Nickery, Bangor, Me.

Abolishment of Grade Crossings in Indianapolis.

The agitation which has long been in progress in Indianapolis in favor of abolishing grade crossings of streets resulted in the passage of an ordinance on Aug. 23 declaring grade crossings within the city a nuisance, requiring their abolishment and authorizing track elevation. The ordinance is substantially the same in its provisions as the Chicago ordinance under which track elevation has been accomplished. It requires that work on the new system shall begin not later than April 1, 1900, and shall be completed in one district within two years and in the other in three years. The movement which resulted in this legislation was started over five years ago. The organized work was conducted by the Commercial Club Elevated Railroad Commission, of which Col. Eli Lilly was chairman until his death in June, 1898, when he was succeeded by William Fortune. The work of the commission was greatly augmented by the Public Safety League, an organization of over 19,000 voters formed for the special purpose of bringing about track elevation, of which Mr. Fortune was also made chairman. The movement has been resisted by the railroad companies, aided by a committee of the board of trade. The fight, however, resulted in the passage of the ordinance by a vote of 16 to 4. Mayor Taggart, who was nominated by acclamation for re-election over his protest on Aug. 26, champions track elevation, and his platform strongly supports it, while the platform of the opposing party contains a declaration in favor of it, but not so satisfactory as the declaration of the party in power. The indications are that the question will be the overshadowing issue in the campaign.

MR. NELSON P. LEWIS,
President American Society of Municipal Improvements.

Prior to the passage of the ordinance plans were prepared by City Engineer Jeup showing the practicability of elevation as the best solution of the grade crossing problem. His plans contemplated the creation of a freight house district in the central part of the city, where the freight depots would be afforded all desirable conveniences for handling freight. These depots would remain at the surface level and would be reached by surface tracks, which, however, would cross only the streets lying within a radius of a few

blocks constituting the freight house district. Mr. Jeup's plans propose a concentration of tracks in a way that greatly simplifies the problem and would necessitate the elevation of but few short spurs used for private switching purposes, his object being to avoid as much as possible disturbance of existing business conditions. He opens nearly all of the principal thoroughfares, without any tracks crossing streets at grades, but in certain business districts leaves a track at the surface level, rising to and descending from the elevated system, to be used in reaching private business switches. These tracks, however, do not cross streets where the travel is heavy, and it is contemplated that their use will be restricted to certain hours of the night when the public would be caused the least inconvenience. Mr. Jeup's plans are merely preliminary as a demonstration of what can be done, but they show good engineering ability and fully meet all objections that have been urged against the practicability of track elevation in Indianapolis, where, in fact, the conditions are exceptionally favorable for this solution of the grade crossing problem.

Liability of a City for Discharging Sewage on Private Property.

The United States Circuit court for the western district of Arkansas has rendered a decision in the case of Carmichael vs. City of Texarkana, in a suit in equity against the city and others to abate a nuisance and recover damages caused by it in the past. The plaintiff owned forty-five acres of well-cultivated land in Texas near the city of Texarkana, Ark. A small brook of excellent water ran through the property, supplying all the needs of the farm. The plaintiff kept a large herd of cattle, and his dairy was a profitable feature of the business in which he was engaged. The city of Texarkana built a sewerage system in 1896, its outlet being in the creek immediately opposite the plaintiff's homestead and about eight feet on the Arkansas side of the state line. The plaintiff claimed that the use of the sewerage system created a great cesspool of foul and putrid matter and sewer gas at the end of the sewer pipe; that the sewage polluted the creek for the 200 yards of its course through the farm, and resulted in a deposit of foul and offensive matter on the bed of the stream because the normal flow of water was too small to carry it off. The plaintiff was compelled to abandon the use of the water for domestic and dairy purposes and to pay $500 for connecting his premises with the plant of the Texarkana Water company, which charged about $2,000 for water delivered between July, 1896, and July, 1898. In addition to an injunction to prevent the continuance of the alleged nuisance, a claim was made for $5,000 damages to the value of the property, $2,000 damages on account of annoyance caused by the nuisance during the two years, and $2,000 for the constant dread of disease and pestilence. The suit was brought against the city, the water company and eight residents of the city, who, by the use of the sewer, were held to be responsible in some degree for the nuisance. Judge Rogers, in rendering a decision, lays down a number of propositions which he considers established by an almost unbroken line of authorities, as follows:

It is immaterial, as affecting the liability of the city, whether the contents of a sewer are discharged directly on the property of an individual or at such point that the sewage and other refuse taken along with it must necessarily be carried there by a conduit or gravitation.

If a municipal corporation, by its system of constructing the sewers, renders an outlet necessary, it must provide one. It cannot discharge its sewage on private property, and, if it does so, it is prima facie liable. Where the city has emptied one of its sewers on private land, it is a direct violation of the owner's rights, a continual trespass on his property, and the city is liable just as any private person would be.

A municipal corporation has no right to collect the sewage of a large portion of a city, and, by artificial channels, cast it up on the lands of another; and for such acts it is liable in damages, whether or not they be done in conformity to a plan adopted by its officers, judicial or otherwise.

A city is liable if it undertakes to collect water in one channel and wrongfully pours it upon another's land. This principle has been uniformly applied to the acts of such corporations in constructing sewers, drains and gutters, whereby the surface water of a large territory which did not naturally flow in that direction was gathered into a body and precipitated upon the premises of an individual, occasioning damages to them. A court of equity has jurisdiction not only to determine the question whether a nuisance exists, but to make a decree that it be abated; but in such case it must clearly appear that the complainant has title to the water course or the land under it and that the nuisance is made out.

The right of an individual citizen to abate a public nuisance arises only when it becomes an obstruction to the exercise of his private rights, or when he receives some special or peculiar injury from it distinct from what he suffers in common with the public.

More Information About the Asphalt Company of America.

A special representative of Municipal Engineering, writing from Philadelphia, says that the Asphalt Company of America, which was incorporated in June under the laws of New Jersey with an authorized capital of $30,000,000, has opened an office in the Land Title building. Inquiry shows that there are six hundred thousand shares of a par value of $50 each. The majority of the stock, if not all of it, has been subscribed for through the Land Title and Trust company, which acted as trustee to receive subscriptions accompanied by the first installment in cash, in payment for shares subscribed for. Other calls will be made if additional capital is necessary. The company is reported to have acquired by purchase several of the principal supplies of asphalt in the United States and one or two elsewhere,

or a large interest in such as they have not fully acquired. It is also reported to have obtained large holdings of stock of several asphalt paving companies as far as it is deemed advantageous to do so.

The purpose of the company is to supply asphalt, but not to lay pavements. It will probably supply crude or refined asphalt directly or through its branches, sub-companies or otherwise, to all contractors and other users of this and other commodities, which, by its charter, the company is permitted to deal in. It is stated that the company will probably not be fully under way to do business until the end of this year or early next year. It is claimed that it is not a trust, but has been formed by a few of the previous existing companies being acquired by new men with ample capital, who have retained the services of those who have had long experience in the asphalt industry, with a view to cheapening the administration expenses and otherwise increasing the profits above the small margins of several companies and the loss on the part of a few small companies, which have taken place during the past few years of depression. The company will, in a measure, do away with a little of the bitter competition between some of the asphalt companies, but it does not expect to control the entire business nor eliminate legitimate competition. Its policy seems to be to place the asphalt industry upon a more conservative and solid basis than heretofore. The stock of the company, in the form of temporary certificates, command a premium of from five to ten dollars per share in Philadelphia exchanges and elsewhere. The engraved or permanent stock is not yet issued.

Data on the Testing of Materials.

A committee has been appointed by the International Association for Testing Materials, to collect data concerning tests of metals, wood and stone, as entering into finished materials supplied in large quantities to railways, manufacturers, etc. The object is to finally establish standard methods of tests for the materials handled in large quantities. The American committee of the association is charged with the task of collecting this data for the United States. It asks the co-operation of engineers and all interested, and it will supply, on application, a classified list of some of the articles about which they wish information. The list covers the testing of cast iron pipes, etc., wrought iron materials, low-steel and high-steel products, objects of tool and spring-steel, copper, brass and bronze castings, tubes, plates, etc., objects made of aluminum or glass, tile, cement and bond materials, textile fabrics, leather beltings, etc., rubber products, paper and wood. M. H. Wickhorst, engineer of tests, C. B. & Q. R. R., Aurora, Ill., will be glad to hear from those interested or likely to possess information useful to the American committee.

What Constitutes "Out of Repair" in Pavements.

Mr. L. M. King, superintendent of the Merchants' Association of San Francisco, recently made a tour through the East for the purpose of gathering information about street paving, and has submitted a report, in the course of which he speaks of the regulations regarding what constitutes "out of repair" in the cities visited. On this subject he says:

"In Buffalo and Minneapolis a depression which will hold water or any other depression or ridge exceeding three-eighths of an inch when a four-foot straight edge is applied to the pavement is sufficient to require repairs. In New York one-half-inch depressions are sufficient to require repairs. Waviness also is not permitted. There is hardly a block of bituminous pavement in San Francisco which would not be considered out of repair if such a test were applied to it. It was interesting to note the care used in making repairs in asphalt pavements and to compare the results with the unsightly patches so frequently seen on our bituminous rock streets. When the depressions are slight, the surface is softened by heat and scraped of, exposing a fresh surface to which the new asphalt will adhere. In other cases the surface coat and binder are cut out. The holes are carefully cleaned and the edges of the old pavement are coated with hot liquid asphalt. When repairs are made next to car tracks, the edge of the rail is painted with hot asphalt, thereby securing thorough adhesion between the rail and the new asphalt. New binder and asphalt surface are then laid and unless the patch is quite small it is rolled with a steam roller. The edges are then so carefully smoothed off that a few hours afterward the patch can hardly be distinguished from the surrounding pavement. A gentleman remarked one day while watching the repair of a street in New York: 'Why they take as great pains with that patch as a tailor would in putting an invisible patch in a coat.' Waviness is now seldom seen in the later asphalt pavements, and on only one street in New York did I see any groove made by wheels of vehicles running with the wheels on one side on the car track. Brick pavements are usually guaranteed for five or ten years. A depression exceeding three-eighths to one-half inch is sufficient to require repairs.

"Various methods are used to overcome the usual objectionable results from opening pavements for laying pipes, etc. The best system is probably that used in Washington, D. C. There the city makes all such repairs with its own workmen. A regular scale of prices per square foot for each kind of pavement is established. Any plumber or contractor must deposit, according to these rates, a sufficient amount to cover the cost of repairing the opening which he expects to make. Each registered plumber is required to deposit $50 before being granted a permit to make a cut in any paved street, and this amount he must keep good whenever called upon to do so. Street railway companies and other corporations making large cuts in pavements are required to deposit a larger sum, varying from $1,000 to $5,000. In some other cities the city lets a contract to one contractor who makes all such repairs at fixed prices, the party making the cut depositing the cost in advance."

Waste of Water at the National Capital.

In his annual report to the chief of engineers, Col. A. M. Miller, corps of engineers, the officer in charge of the Washington

aqueduct, recommends the improvement and extension of the water supply system of the District of Columbia. The average daily consumption and waste of water has gradually increased from 17,554,848 gallons in 1874 to 50,079,855 gallons in 1899. The consumption and waste of water for June 21, 1899, 50,079,855 gallons per diem, which is the largest June measurement ever taken, and, estimating the present population of the district of 280,000, there is obtained a daily per capita consumption of 178 gallons. The report says:

"Careful and trustworthy investigations and measurements made in various cities in the United States show clearly that a per capita daily consumption of 100 gallons is ample for all domestic, business and public puposes, and that any considerable increase above this amount must be attributed to waste, due to defective mains and service pipes, defective plumbing and willful waste. This extravagant use of water has become a serious menace to the supply of water by the Washington aqueduct with its present capacity. The capacity of the aqueduct with a head of 146 feet at the distributing reservoir, a head necessary to keep the present pressure for the gravity supply, is 50,000,000 gallons per diem. If the level of the distributing reservoir were lowered to 144 feet the ultimate safe limit of supply is 76,000,000 gallons. This latter involves a loss of head of two feet, so that to obtain the same pressure with the supply additional pumping would be necessary. The present daily consumption is 50,000,000 gallons, and at the rate of increase per decade for the last ten years, 1889-1899, 22,000,000 gallons, it would reach the ultimate limit of 76,000,000 gallons in about twelve years. The present consumption and waste has also an important bearing on the subject of filtration. Congress has called for a report on the subject, and the matter is now undergoing investigation. It is probable that the cost of filtration will be about $6 per million gallons, or, at the present rate of consumption, about $300 per day, or $110,000 annually. This is a large charge and can only be reduced by a reduction in consumption."

Two remedies are suggested—either the reduction of consumption to a reasonable rate, 100 gallons per capita per diem, or the increase of the present supply to keep up with the present unreasonable and extravagant demand of 178 gallons per capita per diem. To accomplish the former condition would require the introduction of meters.

Test of Water Works.

The annual test of the Racine water works was held at Racine, Wis., recently. The company failed to give the required pressure called for by its franchise, which requires that a pressure of 125 pounds should continue as long as desired. The highest pressure reached was 123 pounds and the lowest 103, and the hour's test showed an average of 109 pounds, 16 pounds less than the franchise demanded. The company is making a number of improvements to the plant, and it is believed that when these are completed another test will be given. Owing to the fact that the city and the water company have been in litigation for some time, many were of the opinion that the company would be compelled to forfeit its twenty-five-year contract when the test failed.

Additional Water Supply for New York City.

A report was submitted Aug. 16 by William Dalton, commissioner of water supply, New York City, in which he favored the execution of a contract between the city and the Ramapo Water company for forty years, under which the company would supply 200,000,000 gallons of water a day from 1902 at $70 a million gallons, or $14,000 a day, aggregating $5,110,000 a year. The proposed contract was opposed by Comptroller Coler and Bridge Commissioner Shea. The board of public improvements was equally divided on the proposition, six on each side, and Comptroller Coler finally succeeded in having the matter laid over for a fortnight. His engineers will, in the meantime, look up the question of the city's necessity for additional water and the financial ability of the city to supply its own necessities. The application of the Ramapo Water company for a franchise to supply the city with water has been before the board of public improvements for nineteen months. Messrs. Coler and Shea are sustained in their opposition to the contract by President Bowley of Queens, President Cromwell of Richmond, Captain Gibson of the Street Cleaning department and Commissioner Kearney of the Public Buildings department. Mr. Coler believes that the city ought to own its own watersheds, reservoirs and aqueducts and declares further that there is no evidence that the Ramapo Water company is capable of furnishing the city the enormous amount of water the contract calls for; or, if it can, the head or pressure will be so enormous that no water main could withstand it. The entire contract is worth $200,000,000 and Mr. Coler, who believes in municipal ownership, says that the city could acquire the right in the Ramapo Hills, while a plant would cost from $70,000,000 to $100,000,000.

Whether the city has a right to make a contract similar to that proposed with the Ramapo Water company without first advertising for bids, is a question that has already been before the courts. In March, 1898, Patrick J. Gleason obtained a permanent injunction against William Dalton, commissioner of water supply, restraining him from entering into a contract with the Citizens' Water company of Newtown to supply 3,000,000 gallons of water a day, and as much more as the commission might determine, at $65 a million gallons, the city to pay at least $213,000 a year to the company. Judge Gaynor granted the injunction, denounced the policy under which the city proposed entering into a contract with the company for three years, so as to enhance the value of the company's plant and then buy it out on terms to be fixed on the expiration of the lease. The injunction was granted on the ground that water was a

material or a supply which came under the clause in the charter which required that there should be public competitive bidding in all cases where the amount was more than $1,000. The case was carried to the appellate division for the second judicial district, where it was overruled, the judgment of the court being that the commissioner of water supply and the board of public improvements have power to authorize and make a contract similar to the one before the court; that the supply of water was not work or supplies coming under the clause of the charter requiring competitive bidding in all amounts of $1,000 or more. The case was not carried to the court of appeals and the Ramapo Water company expects to operate under the law quoted from the decision of the appellate division.

Trouble in the Cleveland Water Works Department.

Charges of fraud in the water works department, under Mayor McKisson's administration at Cleveland, O., led to the recent appointment of a council investigating committee to inspect various departments of the city government. In the water works department it was found that nearly $6,000 had been paid for lead which was never delivered. A number of arrests have been made.

A New System of Collecting Water Rates.

A new system will be inaugurated September 1 in the collection of water rates at St. Louis, Mo. By the payment of 5 cents a consumer may pay his water bill at the nearest drug store, thereby saving car fare down to the city hall and back, and a tedious wait in the office. The 5 cents does not go to the city, but is paid to the express company for its services in delivering the cash to the city. A receipt is given by the druggist for the express company, and a coupon is torn from the customer's notice and sent in with the cash. From this coupon the address is taken and the water office mails the license to the consumer. The transaction, therefore, amounts practically to buying a money order. A similar system is in practise in Chicago, but the assessor and collector of water rates of St. Louis believes that he has improved upon the Chicago system.

To Prevent Water Pollution by Acid Wastes.

A conference of representatives from a number of municipalities was held at Birmingham, England, recently, to consider what action should be taken to prevent the pollution of the sewers and local streams by acid wastes used in connection with the galvanizing and other trades of the Midlands. Resolutions were passed as follows: (1) "That while no local authority would wish to take any measures which will be detrimental to the trade of the district, the members present at this conference are convinced that under no circumstances should untreated acid and waste be permitted to enter sewers and streams. (2) That the foregoing be communicated to the manufacturers affected, and that they be invited to appoint representatives to confer with the combined local authorities."

Executive Authority Over Water Works Exercised by the Judiciary.

A decision was rendered in the district court at Sioux City, Ia., which is of importance to all Iowa cities. Sioux City denied the constitutionality of the recently enacted road measure vesting control of municipal water works in a board of trustees chosen by judges of the district in which the plants are situated. Such systems were formerly under direct control of the city councils. The council of Sioux City sued to test the law, claiming that it violated the right of self-government and clothed the judges with executive authority. The law was sustained, the court holding that it is valid. The case will be appealed.

Protection of Water Supply Streams in Pennsylvania.

A decision has been rendered by Judge Orlady of the superior court of Pennsylvania regarding stream pollution, which will, if not overruled by the supreme court, prove of importance, inasmuch as it will establish a protection long desired by the cities and towns of the state. The case is that of Glen Rock, York county, Pa., against one Yost, a resident who permitted sewage from his premises to flow into a stream which empties into Codorus creek, from which Glen Rock obtains its water. Mr. Yost was indicted for maintaining a nuisance, but he claimed that the stream which was polluted from his premises is the common sewer of the borough; that sewage was required to be conducted into this stream by virtue of a borough ordinance, and that his action in the matter was entirely lawful. The jury agreed with him and acquitted him, the court leaving the jury to decide whether or not the stream in question was a common sewer. The superior court says this was error and orders a new trial; that, notwithstanding the ordinance and the general custom of the borough Yost had no right to contaminate the water for those who have a right to use it below the borough. Judge Orlady says:

"A water course does not lose any of its characteristics because houses are built on its banks, or because they increase in numbers so as to become a borough. No prescription or usage can justify the pollution of a stream by the discharge of sewage in such a manner as to be injurious to the public health. Lapse of time will not legalize a public nuisance. To deposit in a natural water course, in close proximity to a source of supply from which the water is used for domestic purposes, noisome and offensive matter is a public nuisance."

Valuation of Water Works.

The commissioners appointed to appraise the corporate property transferred by the Gloucester Water Supply company to the city of Gloucester, Mass., Oct. 1, 1895, have submitted their report. Section 16, under which the commissioners were appointed, directs the commissioners to determine the fair value of all the corporate property of the company and all the rights, privileges and assessments, lands, water rights, dams, reservoirs, pipes, engines, boilers, machinery, fixtures, hydrants, tools and all appliances owned by the company and used in supplying the city, and the inhabitants thereof, with water, but that such value shall be estimated without enhancement on account of the future earning capacity or future good will, or on account of the franchise of the company. In valuing the property the commissioners followed the rule adopted by the court in the Newburyport case. They found the worth of the physical plant at its cost less its depreciation, Sept. 24, 1895, the water and water rights as property, and have added a sum for a going plant. All the personal and other property not physically attached to the water plant, has been appraised at a fair value. At the respondent's request, the commissioners valued, at what they deemed it worth, a contract existing Oct. 1, 1895, between the city and the company, to furnish the former with water for its hydrants for a certain price until Sept. 28, 1896. The report says:

In valuing the water and water rights, we have practically followed the Newburyport case, i. e.,

1. Valued the water collected in the reservoirs and pond upon the date of the transfer.

2. The water rights of the company, taking into account not only the land, reservoirs, dams and everything else that created them, but also the quality and quantity of water that gathers at these points, and its adaptability to purposes for which it was in use when sold. We have valued this right at what we deemed it fairly worth, taking into account its elevation, proximity, capacity, adaptability, usefulness and connection with and relation to the plant, and having regard to the fact that we are valuing, not what income this water had yielded or might yield in conjunction with the rest of the property, but the right to have water gather at this place to be used for such purpose.

We heard evidence, against the respondent's objection, upon the worth of the rights, based upon the capitalization or consideration of the value (irrespective, as it was claimed, of franchise rights or earning capacity) of the amount of water that could be relied upon to annually collect at these sources. Upon the conditions existing in this case, we do not think that this evidence should be applied.

We admitted and considered the cost of the land, dams and other appurtenances belonging to the water rights, and any improvements and enhancements in, and changes to the same; also the cost of creating and maintaining a supply of water, alike in amount and quality, for use at the distributing plant from two other practical sources, and all evidence bearing upon every other element referred to in the Newburyport case rule, in order to determine the extent and worth of these property rights.

We followed the rule also employed in the Newburyport case that the plant was a going concern and in full operation at the time of the transfer, one that had been tested by experience and with which the city could begin the immediate prosecution of the business of supplying water to the established connections for domestic and municipal purposes (including in the latter hydrant service), and upon an examination of these facts are of the opinion that the property had a greater value for the purpose of its use by the city by reason thereof, than if the plant had not been in full operation, and that this should be considered in passing upon the value of the entire plant.

The respondent claimed that nothing should be allowed under this rule as we had allowed all that was contemplated by the statute. We do not think so. We have ascertained the cost of duplication, less depreciation, of the different features of the physical plant, and have treated the water and the water rights as already stated, but that to our mind does not represent a fair valuation of this plant, welded together, not only fit and prepared to do business, but having brought that business into such a condition that there is an enhanced value created thereby, so that the city in purchasing it, without considering its income or right to do business, but having the power to carry it on on its own account, should pay more for the property as such than as if this consideration did not obtain. This is a value that has been imputed into the plant, which seems to us as much a part of the property valuation as any other part.

In approaching a valuation by this method, we have not considered the past, present or prospective income, good will, or the franchise rights. We have treated it as property which the company can no longer use, but the city can, and is to pay a fair value for upon these conditions.

If, however, the fact of the income which the company was receiving at the transfer is an element that can, under this statute, be considered as bearing upon the question of a fair valuation, this award, we respectfully submit, ought to be reformed, and the question of valuation be reconsidered.

The commissioners, acting upon these principles, awarded the company the sum of $600,000, with interest from Sept. 24, 1895. From this sum is to be deducted about $4,000 in accordance with an agreement between the city and the company, and the amount of the outstanding bonds of the company.

Plans for a Salt Water Street Sprinkling Plant.

A plan for a municipal salt water sprinkling plant was submitted to the council of Oakland, Cal., Aug. 14, by Superintendent of Streets Miller. The plan provides for a pump of 800 gallons per minute capacity, to be operated by a 35 H. P. electric motor; the pump to be suitabbly housed on available land belonging to the city on the northwest arm of Lake Merritt, with a reservoir of 384,000 gallons capacity, with distributing mains and hydrants placed at frequent intervals throughout the city. The heaviest item of expense involved in the plan will be the cost of the distributing mains. The plan is designed to provide salt water for 20 sprinkling carts, distributing loads of 600 gallons each per day, equal to 384,000 gallons per day of nine hours. The plan provides for 329 hydrants placed at such intervals throughout the city that when a cart becomes empty it will have to travel, in nearly all cases,

not more than one block to reach a hydrant for reloading. The total estimated cost of the plant, including reservoir, pump, distributing mains, etc., is $51,288.50.

Improvement of Cuban Highways.

The War department contemplates the improvement of Cuban highways. Orders will be issued to Gen. Brooke to secure reports from the several department commanders in Cuba as to the present condition of the roads and an estimate of the cost of improving them. A general plan for the proposed road improvement will be outlined under Assistant Secretary Meiklejohn and submitted to the President for approval.

Method of Purchasing City Supplies.

The San Francisco board of supervisors recently referred to the Merchants' Association the question of bidding for fire department supplies and requested the association to prepare specifications for this purpose. After a thorough investigation the association made certain recommendations, based, however, on the conclusion that it was impracticable and inadvisable to prepare a schedule containing all articles required during the year, and that it was not advisable to advertise for bids and contract for supplies for as long a period as one year. The plan of purchasing recommended by the association is similar to that followed by the United States government. As set forth by the association it is as follows:

First—Instead of attempting to make an enormous schedule, containing all supplies needed during an entire year, and fixing no quantities, the heads of each department should once a month prepare a requisition of the supplies which will be required by that department during the next ensuing month, these requisitions to have the different articles divided into classes so that each bidder need consult only the class containing the goods in which he deals. Exact quantity desired for that month of each article should be stated. These requisitions should be submitted to the chief engineer for approval, after making such changes as to quantity, etc., as in his judgment seems best, and refer them to the fire department committee of the board of supervisors for approval.

Second—Typewritten or printed copies of these lists in the form of proposals should be sent to all, or at least not less than three responsible firms carrying stock of such articles, inviting them to submit bids on a certain date. If it is made the rule and is known that these lists will be sent out on a certain day in each month, and a copy is posted on the official bulletin board, every dealer in town can, if he desires, ascertain what supplies are wanted, and procure a copy of the proposal from the clerk in case one has not been sent to him.

Third—These bids should be received only from legitimate licensed firms carrying stock of the supplies desired, as provided in present specifications. Brokers, who simply bid on contracts, and depend upon purchasing supplies from wholesale houses as they are required, should not be permitted to bid.

Fourth—The bids should be opened on a fixed day in the presence of all bidders who may attend, by the fire department committee, who will award the order for each item to the lowest bidder.

The advantages of this method are:

First—Only one month's supplies being required, except in the case of small articles rarely used, the heads of departments can easily and closely estimate the quantities required.

Second—Bidders, knowing the quantity and that it is to be furnished within thirty days or at once, can bid intelligently and at the lowest market prices.

Third—It will be necessary for dealers to inform themselves concerning the condition of the funds only when bidding.

Fourth—In cases of emergency, or if during the month some articles are required which were not in the monthly requisition, a special list of these can be sent at any time to not less than three leading houses, and such order given to the lowest bidder, and thus avoid excessive prices, charges of favoritism and pressure for patronage, as is frequently the case when especially designated for this purpose.

Fifth—Such a method will save the unnecessary expense of advertisting the award of contract for each of over 700 articles, many of which are used in small quantities and perhaps only two or three times during the year.

Sixth—Furthermore, in support of these recommendations we beg to report that we have discussed this entire matter with members of the leading wholesale hardware houses in this city, and they unanimously approve this proposed method of furnishing supplies, and state that if the city will adopt such a system they will regularly bid on the monthly supplies and will guarantee the city fair prices.

Engineers and Surveyors Wanted for Service in Porto Rico.

Lieut. H. E. Eames, U. S. A., sanitary officer, desires to engage a superintending surveyor, an experienced transit-man, a level-man and a draftsman for work at Ponce, Porto Rico, preliminary to building a sewerage system. There are about 25 miles of streets to plat and some surveying in the country about the city. Lieut. Eames estimates that there will be about three or four months' work, with the probability of engagements under the contractor when construction begins. Those desiring positions may address Lieut. Eames at Ponce. The usual U. S. rates, together with transportation from New York to Ponce, will be paid.

The Sewage Disposal Plant at Madison, Wis.

The effluent discharge pipe of the new sewage disposal plant at Madison, Wis., has been extended some 40 or 50 feet toward the Yahara so that the effluent may run into the river and thence into Lake Monona instead of flowing into the marsh as it has been doing since the plant started. A railroad track running across the marsh near the plant has held all the effluent and sludge discharged heretofore back in the low ground immediately around the plant. The engineers have resumed the use of ferozone as a precipitant, as it gives more satisfactory results than lime. The amount of sewage being daily received at the plant is about 700,000 gallons, but this amount is said to be due to the ab-

sence of rain. Fears are entertained that the plant will freeze in the winter if it is not enclosed.

Destroying a Bridge by Electricity.

The old wagon bridge across the Wabash river, at Clinton, Ind., was wrecked by electrictly recently. The bridge was a half century old and was the only toll bridge remaining in Indiana. The county had bought the piers from Dr. Bigart, the principal owner, he agreeing to remove the superstructure to make room for a new bridge. Efforts to burn the bridge were found to be impracticable, for this would injure the piers. The sills were moved and electricity applied, and the current was turned on at 5 o'clock in the morning. At 2 o'clock in the afternoon the pile of timbers toppled into the river, leaving the foundation unhurt. The electricity had the effect of cutting all the sills simultaneously, as with so many saws.

Objections to Use of Sewage on Truck Farms.

An investigation was instituted several weeks ago into the methods of sewage irrigation in use on the truck farms south of Los Angeles, Cal. Health Officer Powers and County Health Officer Mathis conducted the investigation, which resulted from complaints that the use of sewage was unwholesome and created a nuisance. They have recommended to the city council and the board of supervisors the adoption of ordinances prohibiting the sale of sewage for the irrigation of certain kinds of fruits, vegetables and garden products. They have agreed that the use of sewage for that purpose is not only injurious to the health of the people residing near the irrigated lands, but is in a measure a menace to the health of the community.

Restrained from Selling Property for a Paving Assessment.

A decision was rendered by Judge Bollinger recently in the case of the Bettendorf Metal Wheel Co. vs. the city of Davenport, Ia. In 1891 the city assessed a paving tax on certain property of the plaintiff, and in 1893 the property in question sold for the general taxes of 1892. Judge Bollinger holds that the city did not have the right to sell the real estate at the tax sale for the paving assessment, and that the assessment of the general taxes for 1892 was a lien superior to the lien of the assessment levied in 1891 for paving. The tax sale in 1893, and the execution and delivery of a tax deed thereunder extinguished the right of the city to sell the real estate for any other tax levied upon the property prior to March 13, 1893, the date on which it was sold. The city is, therefore, enjoined by the court forever from selling the property at a tax sale for the paving assessment levied for the year 1891, and the plaintiff's title to the real estate is confirmed and the defendant is ordered to pay the costs.

Wear of Granite and Brick.

Samples of granite and brick, taken from streets after years of use, were left in City Engineer Leftwich's office recently at Nashville, Tenn. One granite block taken from Church-st., after a use of eleven and a half years, when measured, showed that only ½ inch hand worn away. A vitrified brick taken from Spruce-st., after three years use, showed wear of only ⅛ inch.

Acetylene Gas in the Washington Aqueduct Tunnel.

Under the direction of Lieut.-Col. A. M. Miller, Corps of Engineers, U. S. A., two acetylene gas plants are being installed at two of the shafts of the Washington aqueduct tunnel, which is being put into condition for service. The plants are of 60 and 300 burners capacity respectively. A report regarding the installations, by Lieut.-Col. Miller, says: "The fumes and smoke from blasting, added to the smoke from torches and lamps, rendered the atmosphere underground, especially when the barometric conditions were unfavorable to ventilation, very offensive and discomforting to the workmen. An investigation of the subject of lighting the tunnel by other means, more especially at the locality where the mechanics were at work, brick and stone masons and the workmen on the iron lining, resulted in the selection of acetylene gas as the most available and economical in this special emergency. Gas pipes are carried down the shafts from the plants and run along the tunnel, with cocks for burners every thirty feet, and this system suffices for the illumination of the tunnel for a distance of about two miles. Movable lights of several burners are connected with the cocks by rubber hose, and used to concentrate the light in the immediate vicinity of the work, particularly in the cavities tehind the old lining."

San Francisco's Sewer Commission Invalid.

There was surprise and consternation among the municipal officers of San Francisco when a section of law was discovered, Aug. 7, making invalid the sewer commission which was appointed by the board of supervisors. The law empowers the board to appoint either an architect or an engineer, but not to create a commission. Mayor Phelan will now have the board appoint one of the present commission a chief engineer and empower him to employ assistants. Had the present commission been permitted to proceed any bond issue that might have ensued for sewer purposes would have been invalid.

Another Attack on the Barrett Law.

Suit has been filed in the Indiana supreme court by Thomas B. Adams of Shelbyville,

in which the constitutionality of the Barrett law is attacked. The plaintiff, who is contesting the payment of assessments for improving Broadway-st., in Shelbyville, claims that the street was improved but a short time before and the abutting property assessed.

Rights of Owners of Asphalt Deposits.

A decision was rendered in Trinidad recently as to whether asphalt is a liquid or solid. The stratum of land pitch in Trinidad is from four to seven feet below the surface, and when cut through the pitch melts and oozes out, making it possible for a man, digging down near his neighbor's lot, to collect pitch coming in from under his neighbor's land. One neighbor brought suit whose pitch had been thus taken. The defendant claimed that an underground stratum of pitch was like so much water, no man's property until appropriated. The court held, however, that pitch was a mineral, and that one man had no more right to abstract it from a neighbor by the oozing process than he would have to tap his deposit of iron or silver.

Patents on Asphalt Repair Apparatus.

The ruling of the United States court for the northern district of New York in dismissing the suit against the Standard Paving company, for infringement of the patents on the asphalt repair apparatus of the United States Repair and Guaranty company, having been affirmed by the United States Circuit court of appeals, second district, in a decision rendered by Judge Shipman, the matter has an important bearing on asphalt interests. Other litigation is pending, and the contention over the patents is not yet at an end. It has been claimed that the New York cases were not presented in a way to fairly and fully test the question. The patents on the methods of the United States Repair and Guaranty company were issued to Amos H. Perkins, an employe of the Western Paving and Supply company, and the apparatus has borne his name. An exclusive license was given to the Barber Asphalt Paving company and the suit against the Standard Paving company was instituted by the United States Repair and Guaranty company and the Barber company. Another suit, filed prior to the Shipman decision, is against the Assyrian Asphalt company, and in this case a very able brief has been filed by Raymond & Omohundro, reviewing the methods under question.

The case hinges on the question as to whether there was a prior method similar to the one patented by Perkins. In 1880 a patent was granted to Paul Crochet, a Frenchman, for a method of repairing the rock asphalt pavements of France by the use of intense heat in melting the material. This, it is claimed, anticipated the Perkins method, and it is this contention that has been sustained in the case against the Standard Paving company. By the use of a movable furnace Crochet heated the part to be repaired until it became sufficiently friable to be removed by iron rakes, the part not removed being left in a roughened state. The repair was then made by tamping new asphalt over the depression. The differences between American asphalt and the natural rock asphalt present, it is claimed, distinct differences in the Perkins and Crocket methods. It is claimed that "the two methods are constitutionally different and demand different methods and different apparatus in repairing," and that "it is impossible to use the Crochet method with the American mixture." What Mr. V. W. Foster calls the phenomena of the application of heat to an old asphalt mixture pavement by the Perkins method are: "First, the instantaneous application of the intense heat of a flame in the surface of the pavement causes radiation and capillary attraction, bringing an excess of bitumen to the surface of the pavement (as grease from a garment may be drawn upward into the superposed piece of cloth upon which a hot flatiron is laid) which carbonizes and forms a thick crust of the surface material of a thickness not more than one-quarter of an inch when the work is properly done. This crust is formed almost instantly, or, at any rate, is the first result of the application of the blast of heat to the surface of the pavement. Thereafter, if the heat is not too long applied, the melting and not the burning rays of heat are communicated to that part of the pavement material below the crust, the crust on the one side and the concrete base on the other side making the sides of a comparative vacuum chamber in which this material can be melted without volatilization. We found it necessary to apply an intense heat, and to work rapidly and intelligently in the use of the heater. In my judgement, the formation of this crust which produces what I have called a vacuum chamber is the real secret of the Perkins method of repair and explains the failure of the prior attempts to reduce the old mixture to the original condition by the application of heat thereto, because in all such prior attempts the heat had been applied in open chambers on pans where the volatilization was unrestrained."

There appears to be good ground for the contention that there is a marked difference between the Crochet and Perkins methods. In the brief on file in the United States Circuit court for the northern district of Illinois Judge Raymond broadly contends that "there is not a particle of evidence in this case even tending to show that, either in this country or in any other country, heat was ever used by anybody, in any method or process, or by any means whatever, in repairing the top layer of any kind of pavement made of any kind of material, so that a material part of the top layer could be so softened as to be easily removed, and the original top layer be so heated, deep down, without burning, as that, when the new ma-

terial of patch was added, there should be an immediate, direct, positive and homogeneous union between the old and the new materials and the repaired top layer or pavement be left in the condition it was in when first and originally laid; and, until the discovery of Perkins, it had not entered the mind of man that it was possible by heat to create a thin crust and through it reduce the material below it to the soft, plastic and desired condition in which it was first and originally laid, without burning it, or in any other manner deteriorating it."

Detroit's Sanitary Engineer Says Sewer Air Is Harmful.

To the Editor of Municipal Engineering:

Sir—I read with some interest and surprise, the article on "Sewer Air; Mistaken Ideas Concerning It," which has just appeared in your August issue—surprised at some statements made and amused in that after the writer has proven sewer air to be harmless, and even if not, the utter impossibility of any of it by any means getting access to the house, he should close by saying he "does not advocate the tolerance of bad plumbing." He is hardly consistent, being afraid to accept the logical results of his own conclusions.

To the casual reader this article reflects upon the value of sanitary drainage and plumbing. Having charge of such work in Detroit and coming in daily contact with men engaged in the work, I am in position to make reply as to the effects of sewer air upon persons who come in contact with it. What I have to say will be what I have seen and found in my own work, as I have been called upon to make examinations and tests of the sanitary conditions of buildings, both public and private, to see if air from the drains is present and its effects upon the public health.

The physicians of this city are required to report to this office, as fast as they are discovered, all cases of contagious disease. In the office hangs a map of the city and as soon as the case is reported its location and character is indicated upon the map by a colored pin, each disease having its own color. These remain until the recovery or death of the patient. Thus at a glance we know just how many cases of contagious disease there are in the city, their nature and location. A study of this map for a year will bring out several facts which have a bearing upon the probable effect of sewer air upon those who are exposed to its influence.

First. The pins will be found grouped in those localities where the drainage is poor. On visiting these places we invariably find open cess-pools and untrapped drains to the lateral or main sewer.

Second. When under our health regulations we are enabled to bring about a removal of these cess-pools and to have the drains properly trapped, we find an immediate decrease in the sickness in that particular locality.

Third. In those portions of the city where there is sanitary drainage and plumbing, there is comparative freedom from these cases.

Fourth. The season of the year has an effect upon their numbers. During the warm months, when the houses are open, there are very few cases. As soon as the cool weather sets in and people are driven in doors, to live in rooms impregnated with the air from these drains, there is a rapid rise in the number of cases and continuing until the warm weather reappears.

Our experience is that men who are employed over drains and plumbing are not healthy—that such men, unless they soon quit the work, are in a few years broken in health. These men come in contact with sewer air. Those who are engaged in laying new sewers or drains do not come in contact with it to any great extent, and they are healthy, but they should not be taken as an example of the healthfulness of the occupation of working about sewers.

My own experience as to the possibility of sewer air getting into the modern city house is contrary to what is stated by Mr. Kinnicutt. I find not only "pin hole openings" but loose joints and connections upon old work sufficiently large to allow the entrance of the air from the house drains every time a fixture is discharged. At such a time the air in the plumbing lines is under pressure and the air is forced into the rooms as stated. On our present plumbing, provission is made so there can be no pressure or air binding at any point.

Scientifically sewer air may be harmless, but practically experience does not confirm the verdict, but goes to show it is an enemy to be feared.

A. B. RAYMOND,
Sanitary Engineer, Detroit, Mich.

New Publications.

Municipal Public Service Industries. By Allen Ripley Foote. 337 pp. The Other Side Publishing company, Chicago.

This volume is composed of three discussions of questions involved in the ownership, operation and proper regulation of municipal public service industries, written for different occasions. The first one in the book is the latest in delivery and contains the most complete and orderly presentation of the ideas of the author. Many of the points he makes are the same that this magazine has been discussing for some years, and the author gives added force to them by placing them in their proper sequence in the full line of argument. The general title of the essay is "How Should the Franchise Question be Settled?" The general conclusion reached is to the effect that all such natural monopolies as are public service industries should be under the ownership of the public, but should be paid for, both in first cost and maintenance by the users. The operation of

plants may be leased for short terms to private companies. Some of the arguments advanced would not lead logically to the conclusions stated, and in some instances statements of opinions or personal conclusions are presented without proof as "convincing arguments" of the truth of a conclusion, but the discussion is none the less interesting and may serve as a program for more detailed study of the subject. Not all will agree with the author's desire to relieve the taxpayer, as distinguished from the user of the industry, of any portion of the cost. Undoubtedly the property whose value is increased by the presence of water on a street should pay his share of the cost, whether he uses the water or not. He is not entitled to such an "unearned increment" of its value. Because he does not pay any portion of the cost if the system is owned by a company is no reason for escaping if the city owns the plant. That is one of the inequalities arising from private ownership which municipal ownership is expected to correct. There is not space here to discuss the many interesting questions presented and they will be taken up hereafter in other columns of this magazine. The remaining essays give additional evidence upon many points and many citations from various authorities.

Second Report of the Sewerage Commission of the City of Baltimore, 1899. Mendes Cohen, F. H. Hambleton, E. L. Bartlett, Commissioners. Kenneth Allen, Principal Assistant Engineer.

The first report of this commission proposed to discharge the sewage of the city into Chesapeake bay. This report caused so much apprehension that the oyster interests of the city and bay would be unfavorably affected or destroyed, as in New York bay, that the commission was requested to continue the study still farther and revise its plans or bring additional arguments in their favor. This second report repeats the recommendation of the first and discusses in detail the reasons for assuming that such method of disposal will not injure the oyster trade of the bay in the slightest degree. To comply with all its instructions, however, the commission has taken up the study of methods of sewage treatment and, instead of visiting foreign works, has secured a report, based on personal inspections, from James Mansergh of London, vice-president of the Institution of Civil Engineers. On the basis of this report it eliminates many methods of treatment from the consideration and then makes some suggestions of methods of sewage treatment and gives estimates of the cost of construction and maintenance for first installation and for a plant to serve a population of 1,000,000 varying from $5,573,331 for the latter plan, discharging crude sewage into the bay, to $9,860,241 for agricultural filtration of all the sewage, the cost of special partial treatment before discharge into the bay and of agricultural filtration for low-level sewage with the special treatment of the remainder lying between these two extremes. The installation of any of the systems for the present needs will cost but little more than $3,000,000.

Mr. Mansergh's report is valuable because it gives in such convenient form a comparative view of the various bacterial processes of treating sewage in England by one who is competent to perceive and present for consideration the advantages and disadvantages of each. Illustrated descriptions are given of special installations of the processes called Dibdin's bacterial filters, Cameron's septic tank, Lowcock's aerated bacterial filters, the Ferozone-polarite process and Ducat's self-acting bacterial filter. Accompanying the report is a paper by Dr. G. Sims Woodhead discussing the theory of the action of the various systems. The report considers the application of each system to the conditions at Baltimore and gives the reasons for deciding against all of them, with which conclusion the commission agrees. Descriptions are also given of Waring's process as installed at Willow Grove Park, near Philadelphia; of the Pennsylvania Sanitation company's method, and the Scott-Moncrieff system. All of these systems are reported as unsuitable for one reason or another.

The city will now probably have the opportunity to decide whether to adopt the simpler method or partial or total purification with the strong recommendation of a competent commission in favor of the simplest and cheapest plan. No complaint of suppression of necessary information can be made in the presence of the two large and complete reports of the commission.

Technical Meetings.

The New England Water Works Association will meet in Syracuse, N. Y., Sept. 13.

The convention of the Central States Water Works Association will be held in Cincinnati, O., Sept. 5-7, with headquarters at the Grand hotel. John Fisher, secy., box 203, Hamilton, O. R. B. McGowan, care J. H. McGowan & Co., Cincinnati.

The convention of the League of American Municipalities will be held in Syracuse, N. Y., Sept. 19-22.

A good roads convention will be held in La Crosse, Wis., in October.

Personal.

George H. Paddock, C. E., died recently in Philadelphia, Pa.

Willis E. Meyers has been appointed city engineer at Kenton, O.

W. A. Farish has been appointed city engineer at Phoenix, Ariz.

Harvey Linton has been re-elected city engineer at Altoona, Pa.

Holland Wheeler has been appointed city engineer at Lawrence, Kas.

David Kirk has resigned his position as city engineer at Chippewa, Wis.

John Shannon has been elected city engi-

neer at Oskaloosa, Ia., to succeed Sam Ver Veer, resigned.

E. P. Fisher has been appointed superintendent of water works at London, O.

Martin Blakemore, Louisville, Ky., has accepted a position with the Barber Asphalt Paving company.

H. H. Fuller has resigned his position as first assistant engineer on the staff of the city engineer at St. Paul, Minn.

E. W. Boynton, Davenport, Ia., has resigned his position as commissioner of public works, to take effect Sept. 1.

George W. Rafter, M. Am. Soc. C. E., has been engaged as consulting engineer by the Canal advisory board of New York.

D. B. Miller has been elected city engineer at Columbia, S. C., to succeed Charles C. Wilson, who resigned recently to go abroad.

Ellis L. Bierbower, general manager of the Omaha Water company, Omaha, Neb., died Aug. 17 of appendicitis, aged thirty-nine years.

Daniel J. Harrington has been appointed sewer inspector in the engineering department at St. Paul, Minn., to succeed W. F. Simonds.

H. R. Fehr has resigned his position as city engineer at Easton, Pa., to become superintendent of the Easton, Palmer & Bethlehem Electric railway.

John W. Lyons, cashier of the city water works office at Chicago, Ill., died Aug. 20 of pneumonia. Mr. Lyons had held the position he occupied for twenty-one years.

E. E. Brownell, Dayton, O., has been engaged to make a survey of the system of underground pipes in Springfield, O., and report on the damage caused by electrolysis.

William R. Hill, M. Am. Soc. C. E., chief engineer and superintendent of the Syracuse water department, has been engaged by the city of Elmira, N. Y., to appraise the plant of the Elmira Water Works company.

Alfred Noble, M. Am. Soc. C. E., was given a farewell dinner at the Technical club, Chicago, on the occasion of his departure, Aug. 5, to join the new Isthmian canal commission, of which he is a member.

Prof. Albert Kingsbury, M. Am. Soc. M. E., who has had charge of the mechanical engineering department of the New Hampshire college of agriculture and mechanical arts, has been appointed professor of applied mechanics at the Worcester Polytechnic Institute.

Lieut-Col. Oswald H. Ernst, Corps of Engineers, U. S. A., sailed for Europe recently to investigate the French data relating to Isthmian canals. Rear Admiral J. G. Walker, George S. Morison and Prof. William H. Burr, members of the new Isthmian Canal Commission, have also sailed.

Albert Howell Porter, Assoc. M. Am. Soc. C. E., Niagara Falls, N. Y., died at Tiverton, R. I., Aug. 8, aged 35 years. Mr. Porter was formerly connected with the Croton aqueduct work in New York City and was resident engineer of the Cataract Construction company at Niagara Falls.

Thomas H. Carlin, Allegheny, Pa., who has sold his interest in the firm of Thos. Carlin's Sons to his brothers, William J. and J. H. Carlin, sailed for Europe Aug. 15 for the purpose of investigating the methods and machinery employed in the clay, coal, cement and contracting business abroad.

George L. Wilson, M. Am. Soc. C. E., has been appointed first assistant engineer in the city engineer's department at St. Paul, Minn. F. W. Steeg has been appointed second assistant engineer to fill the vacancy caused by the resignation of C. L. Annan, M. Am. Soc. C. E., who has joined the engineering department of the Great Northern Railway.

Henry C. Bowen died July 26 in North Fenton, N. Y., aged fifty-five years. He was the inventor of the Bowen needle used to determine the consistency of asphalt. He studied chemistry in the United States and Germany, and was chief chemist to the Barber Asphalt Paving company for about ten years. During the last two years of his life Mr. Bowen was chiefly engaged in original researches with different asphalts.

MACHINERY AND TRADE.

Recent Inventions.

(Reported especially for MUNICIPAL ENGINEERING, by Arthur M. Hood, Indianapolis, Ind. Copies of any patent may be obtained for ten cents.

No. 629,576, July 25, 1899. Excavating Apparatus—H. C. Lowrie, Denver, Col. The swinging truck beam, upon which is mounted the excavating scoop and plow, lies transversely with relation to the channel or ditch and this beam may be angularly adjusted; also moved longitudinally along the excavation.

No. 629,695, July 25, 1899, Excavating and Conveying Apparatus; F. B. Knight, New York, N. Y.—The digging edge of the scoop is provided with a series of peculiarly-formed plow-shaped teeth and this scoop is supported on a trolley running upon cables stretched across the excavation.

No. 629,826, Aug. 1, 1899, Road Scraper and Carrier; J. A. Taylor, Lima, Ind.

No. 629,826, Aug. 1, 1899, Bridge; W. E. Gunn, Covington, Ky.—A suspension bridge in which each tower is composed of three members, one upright and the other two diverging from the base and inclined in the direction of the length of the bridge.

No. 629,935, Aug. 1, 1899, Suspension Bridge; N. H. Sturgis, Guthrie, Okla.—The floor is laid upon horizontal cables which are supported by means of the transverse beams suspended from the lower ends of the rods which are in turn suspended from the main cables.

No. 629,950, Aug. 1, 1899, Illuminated Anti-slipping Walkway; W. H. Brown, Indianapolis, Ind.—The glass or lights are supported in a suitable frame and separated by lead sections which extend above the upper faces of the glasses so that the tread is upon the lead ribs thus formed.

No. 629,951, same inventor, similar invention, differing slightly in detail.

No. 630,063, Aug. 1, 1899, Granular-bed Filter; J. A. Maignon, Philadelphia, Pa.—A process of forming granular-beds for filters which consists in saturating a mass of granular material with water until the horizontal plane of water is established as close as possible to the upper surface of the water and then reducing the upper surface to parallelism with the surface of the water.

Trade Notes.

The O. S. Kelly company, Springfield, O., has sold a stone crusher and road grader to the city of Burlington, Ia., according to press reports.

The General Incandescent Lamp company, Cleveland, O., has been incorporated to manufacture electrical machinery and electric lamps by I. Unsull, F. H. Goff, T. H. Bushnell and S. H. Tolles.

The Royal Sewer Pipe and Press Brick company has purchased the plant at Midvale, O., and will begin operating it.

Marl beds have been found near East Tawas, Mich., which are pronounced valuable, and a cement mill will probably be built.

The Rotary Snow Plow company, Kingston, N. Y., has been incorporated to manufacture snow plows by E. Peckham and T. Spave.

The works of the Glens Falls Portland Cement company, Glens Falls, N. Y., were totally destroyed by fire Aug. 6, entailing a loss of $250,000.

The Peninsular Portland Cement company, Jackson, Mich., recently organized with a capital stock of $368,700, has increased its capital to $875,000.

The Cherryvale Vitrified Brick company is a new company located one mile northwest of Cherryvale, Kas. L. S. Skelton of Blackmil, Ok., is interested.

The Pennsylvania Asphalt Paving company of Philadelphia is building a plant for mixing asphalt at the northeast corner of Sedgeley-ave. and Lamb Tavern road.

A company has been organized, in which Dr. Geo. W. Combs and Edward L. Robinson of Indianapolis are interested, to manufacture cement at Bedford, Ind.

The Chicago Crushed Stone and Paving Brick company, Chicago, Ill., has been incorporated by A. W. Underwood, J. A. McKeown and J. V. Norcross of Chicago.

The Cumberland Valley Cement company has acquired possession of the cement mill at Cedar Cliff, Md., the capacity of which it will increase and then put in operation.

The Bellingham Generator company, New Whatcom, Wash., has been incorporated to manufacture acetylene gas engines by I. Mayhew, N. Hinsdale and W. L. Minturn.

The Merrimack Paving company, Jersey City, N. J., has been incorporated by Albert G. Thompson, Peter F. Conaton, John Ryan, Chas. H. Hanson and Kenneth K. McLaren.

Peter Commore and T. Drehanbeaw of Bay City, Mich., have discovered large beds of fire clay and deposits of marl at West Branch, Mich., and will erect a plant.

The Northwestern Scraper company, Anderson, Ind., elected a board of directors, July 28, of whom C. F. Heritage, R. E. Burke and I. D. Bosworth, old directors, were re-elected.

The Phoenix Construction company, Nazareth, Pa., has been incorporated by J. H. Beck, G. W. Lamb, M. W. Schaffer, F. C. Schweyer and F. H. Fanks, to manufacture cements.

The United Asphalt company, 55 Montgomery-st., Jersey City, N. J., has been incorporated to manufacture, mine and refine asphalt by Orray E. Thurber, Newark, N. J., and Norton C. Lyon.

The Whitehall Portland cement company, Philadelphia, Pa., has been incorporated to manufacture cements. The incorporators are J. S. Wentz, D. B. Wentz, Mary D. Wentz and E. Twining, of Mauch Chunk.

The Omega Portland Cement company has awarded a contract to Robert Lake of Jackson, Mich., for the construction of a new plant at Mosherville, Mich. T. J. Byers and O. F. Jordan of Jackson are interested.

Fraser & Chalmers have established sales offices at 1426 to 1429 Marquette Building, Chicago, for the convenience of customers who may not wish to go out to their works. The down-town offices are opposite the new postoffice.

The Sargent Brick company, Painesville, O., has been incorporated to manufacture and deal in brick, tile, cement and clay products. J. D. Sargent, C. H. Horton, V. E. Wyman, C. H. Stocking and W. T. Cowles, incorporators.

The New Jersey Engineering and Construction company, Morristown, N. J., has been incorporated to construct and equip gas and electric plants, by Frederick N. Taff, Millington, N. J.; Frederick W. Schmidt and Louis C. Bonnell, Morristown.

The Joseph Dixon Crucible company of Jersey City, N. J., has issued a new catalogue of 62 pages, describing and illustrating their graphite productions. It is a valuable piece of business literature, copies of which can be obtained by addressing the company.

The Globe company of Cincinnati, with branches in New York, Chicago and Boston, and the Wernicke company of Grand Rapids, Mich., have effected a consolidation, dating from Aug. 1. The corporate name of the consolidated companies will be the Globe-Wernicke company of Cincinnati.

The Sturtevant Mill company has issued a new circular descriptive of their roll jaw rock breaker and fine crusher, which, they claim, will do the work of a crusher and two pairs of rollers. The prices range from $500 to $1,800, according to size, and the capacity from one and one-half to six tons of hard granite per hour.

Fraser & Chalmers of Chicago have printed in pamphlet form, under the title of "Warning," the decision of Judge Hallet sustaining the patents of Horace F. Brown on roasting furnaces and declaring the Ropp furnace to be an infringement, as well as all other furnaces, no matter by what name they may be described. Fraser & Chalmers have the right to manufacture, use and sell for use the Brown furnaces.

Competitive designs for covered dust carts have been submitted to the London county council, in response to an advertisement of the council offering a premium of £25 for the best design. The premium was awarded to W. Glover & Sons, limited, of Warwick. A public exhibition of the models and designs submitted will be held at the Parkes Museum.

The plant of the Lake Erie Asphalt company at Ironville, Toledo, O., has been completed and is in operation. This plant is a branch of the Newcastle Asphalt Block company of Newcastle, Pa. The building of the new plant is 420 feet long and 100 feet wide. It is equipped with five engines and a Stillwell-Bierce pump. The floors of the building will be paved with asphalt blocks.

A decision has been rendered in favor of the Bradley Pulverizer company of Boston, Mass., in its litigation over the patents upon the Griffin mill. The Bradley Pulverizer company sued the Whittaker Cement company, users of the Griffin mill, for infringement of the U. S. patent No. 277,134, issued to Huntington for a crushing mill. In the first case the U. S. circuit court held that the Griffin mill did not conflict with the Huntington patents. The circuit court of appeals for the Third circuit reverses this decision, and gives Huntington's patents a narrow construction and is held not to cover the construction adopted in the Griffin mill.

Hetherington & Berner have under construction for the Ayers Asphalt Paving company one of the finest railway asphalt plants that company has yet built. There are many new and valuable features about this plant in the matter of detail, but in general it will be similar to the regulation plant, the main difference being in the subdivision of power and the application of a new system of melting the asphalt by steam instead of by direct heat. The capacity of the plant will also be greater than any yet built. The Hetherington & Berner company have succeeded in reducing the constructive work of building their railway asphalt plant to such a complete system that a plant can be turned out in a remarkably short time, considering the extent of the work. Their drawings, in general and detail, cover hundreds of sheets. In the spring of the current year their factory turned out three railway plants inside of ninety days time.

IMPROVEMENT AND CONTRACTING NEWS.

PAVING.

Muscatine, Ia.—This city is experimenting with clam shells as a paving material. About six blocks of Eighth-st. has been completed.

Anderson, Ind.—The Ninth-st. paving suit, tried recently before Special Judge Walker, was certified to the federal court, Aug. 23. It is probable that no action will be taken until October.

Chicago, Ill.—Marshall Field has made an offer to the city, which has been accepted, to pay for paving State-st., from Randolph to Washington, and Washington, from State to Wabash-ave., with asphalt.

Charleston, Ill.—Aldermen I. H. Johnston, jr., C. L. Lee, J. H. Balls and Henry Root, Street Superintendent Ross Hampton and City Clerk Frank Johnston visited Veedersburg, Ind., Aug. 16, to investigate paving brick.

Toledo, O.—The street commissioner has begun to lay samples of paving brick furnished by different companies. The work is being done under the supervision of the city civil engineer, on Jackson-st., between St. Clair and Summit. About sixteen different samples will be laid.

Owosso, Mich.—The street paving constructed last year is proving unsatisfactory, and City Engineer H. E. Riggs refuses to approve the work. He is of the opinion that about four blocks of brick and asphalt will have to be relaid. The fault seems to be with the concrete, which was laid in cold weather and was frozen.

Johnstown, N. Y.—Martin Murray, who has the contract for paving Washington-ave., from Perry to Mill-st., a distance of a quarter of a mile, made excavations preparatory to paving, according to instructions from the city authorities. It has been discovered, however, that the excavations from Perry to Market are one foot too deep, and will have to be refilled before the contractor can proceed with the paving.

Detroit, Mich.—Twice bids have been rejected for asphalt paving this season because the Board of Public Works believed the prices to be too high. Bids were again opened on August 23, and it was found that a new bidder, James Hanley, had entered the field, and had bid from 30 to 40 cents per square yard below the prices of the old companies. He proposes to use a California asphalt. The bids were as follows:

Canfield-ave., Woodward to Second James Hanley, $10,690, or $2.33 per square yard; Barber Asphalt Co., $12,198; Alcatraz, $12 648.

Erskine-st., Woodward to John R., James Hanley, $4,410, or $2.40 per square yard; Barber Co., $5,064; Alcatraz, $5,150.

John R., Cross to Adelaide, James Hanley. Medina curb, $15,578, $2.79 a yard; Elyria curb, $15,355, or $2 76 a yard; Barber Co., $17,784 and $17,598; Alcatraz, $18,450 and $18,254.

Elliot-st., Woodward to John R., James Hanley, Medina curb, $4,418, or $2.40 a square yard; Elyria curb, $4,327, or $2.35 a square yard; Barber Co., $5,072 and $5,011; Alcatraz, $5 259 and $5,118.

Grummond-ave., (new paving by petition), from Woodward-ave. to Hamilton boulevard, James Hanley, with Medina curb, $19,150, or $2.61 a square yard; Elyria curb, $18,840, or $2.51 a yard. The Barber Co. bid $.2,633 and $21 517; the Alcatraz bids were $22,830 and $22,314.

Rosedale court (forced paving), Woodward to Oakland, James Hanley, Medina curb, $20,013, or $2.65 a yard; Elyria curb, $19,328, or $2.56 a yard. The Barber bids were $23,068 and $22,544; the Alcatraz, $23,910 and $23,384.

CONTEMPLATED WORK.

Englewood, N. J.—The council voted bonds for macadamizing.

Hoboken, N. J.—Asphalt paving is contemplated for Palisade-ave.

Kendallville, Ind.—Brick paving is contemplated. Henry S. Bortner, cy. engr.

Bellevue, Pa.—This city has voted for street paving and sewers.

Davison, Mich.—The principal streets of this village will be paved soon.

Eden Valley, Minn.—The question of building cement walks is being considered.

Bristol, Conn.—This town has appropriated $9,000 for building macadam roads.

Elyria, O.—The paving of W. Bridge-st. and W. Third hill has been authorized.

Sioux Falls, S. D.—Paving is contemplated for Eighth-st., from the bridge to Ohio-ave.

Lockport, N. Y.—Bids will be advertised for paving Richmond-ave. with brick.

La Crosse, Wis.—An ordinance was passed Aug. 11 providing for six blocks of brick paving.

Albany, N. Y.—Livingston-ave. will be paved with granite block or brick.

Spokane, Wash.—Paving is proposed for Sprague-ave., from Monroe to Bernard.

Van Buren, Ind.—The town council decided recently to pave First and Main-sts. with brick.

Mankato, Minn.—Brick paving is favored for Front-st. and the side streets for a block.

Chattanooga, Tenn.—The residents of Eighth-st. are in favor of that street being paved from B-st. to the bridge.

Bettsville, O.—Macadam paving is contemplated for about two blocks of the main street. Cy. coun.

Zanesville, O.—Estimates have been ordered prepared for paving Orchard-st.

Louisville, Ky.—Bids will be asked soon for paving 6,523 ft. of Bardstown pike with asphalt.

Topsfield, Mass.—Surveys are being made for a new highway between this place and Danvers.

White Plains, N. Y.—Plans are being prepared for macadamizing the streets. Vil. Engr. Darling.

Oakland, Cal.—The council has decided to expend $5,000 in improving Independence square at East Oakland.

Sing Sing, N. Y.—The property-owners on Clinton-ave. have petitioned the board of village trustees for macadam paving.

Youngstown, O.—A resolution has been passed to macadamize Mill-st., from Pike to Joseph. F. C. Brown, cy. clk.

New Haven, Conn.—The committee on streets has recommended brick paving for Chapel-st., from East to Ferry.

Wheeling, W. Va.—The board of public works has been authorized to advertise for bids for paving Main and Ohio-sts.

Pittsburg, Pa.—The question of completing the Grant and Beechwood boulevards will be voted on Sept. 19. Wm. T. Diehl, mayor.

Kearney, N. J.—Ordinances have been passed providing for grading, curbing and flagging Van Emburg-ave., from Schuyler-ave. to Argyle-place.

Newport News, Va.—The street committee of the council is considering the question of engaging a consulting engineer in connection with the proposed paving.

Minneapolis, Minn.—A motion was referred Aug. 18 to the committee on paving to pave First-ave., N., with sandstone, and Third-ave., N., and Twentieth-st. with brick.

Windsor, Ont., Canada—(Special)—William Newman, cy. engr., says a by-law has been passed to raise and expend $200,000 on street improvements, the work to be commenced at once.

Newark, N. J.—A resolution has been adopted to pave Stone-st. with brick or concrete. A resolution has also been adopted to repave Washington-ave. with asphalt.

St. Johnsbury, Vt.—The formation of a company to purchase portable crushing

plants, steam rollers, etc., for macadamizing the streets, is being considered.

Kansas City, Kas.—Resolutions have been passed for paving two streets with brick, and ordinances have been passed for paving four streets with brick.

Toronto, O.—Asphalt paving is recommended for Palmerston-ave., between College and Arthur-sts., and cedar block paving for Spadina-ave., from Adelaide to Queen, by the city engineer.

Ripon, Wis.—The council decided Aug. 20 to pave the main business street with brick, and also ordered that the sidewalks of the business district be paved with cement.

Mattoon, Ill.—The contract for about 1½ mis. of 6-ft. concrete walks will be let soon. Also the contract for one block of alley paving will be let about the middle of October. A. C. Loomis, cy. engr.

Hamilton, O.—Plans and specifications have been submitted for paving the west side of Eighth-st., between Walnut and Hanover, with cement or brick, with limestone or cement curb and gutter.

Jersey City N. J.—Specifications have been ordered prepared for repaving Pacific-ave., from Grand-st. to Johnston-ave. The property-owners on North-st. are divided on the question of paving that street with asphalt or Belgian blocks.

Alton, Ill.—Petitions are being circulated asking the council to pass ordinances for brick street paving. Mayor Young and a party of aldermen visited Chicago Aug. 15 to inspect asphalt paving and it is probable that some of the streets will be paved with that material.

Saginaw, Mich.—City Engineer Terry has submitted estimates for brick paving on Michigan-st. as follows: Between M. C. railroad and Holmes-st., $15,703.49; between Holmes and Grant-sts., $2,950.10; between Grant and Wheeler-sts., $4,548.48; paving street intersections, $3,259.22.

Denver, Col.—Plans are being prepared for 9 miles of street grading and 18 miles of stone sidewalks. A petition has been filed with the board of public works asking that Grant and Logan-aves., between Sixth and Eighth, be surfaced with a black rock which is found near Golden, Col., and in the southern part of the state.

St. Paul, Minn.—A resolution was passed Aug. 7 to pave Summit-ave., from St. Peter to Rice-st., with brick, and from Rice to Sixth with asphalt. Samples of asphaltina have been submitted to the city council and board of public works for investigation. The samples will be tested by the city engineer.

Milwaukee, Wis.—Resolutions were passed Aug. 22 to pave, National-ave., E. Water, Biddle and Broadway-sts. Resolutions were introduced to pave Grand-ave. and Chestnut and Twelfth-sts. Grand and National-aves. will be paved with asphalt. The question of opening Terrace-ave. through the grounds of St. Mary's hospital is being considered.

Indianapolis, Ind.—City Engineer Jeup has been ordered to prepare plans for asphalt paving and cement sidewalks on Talbott-ave., from Twenty-fifth-st. to Fall Creek; cement sidewalks on Delaware-st., from South to McCarty, and Harrison-st., from Noble to Pine; gravel roadway, brick gutters, cement walks and curbing on Beech-st., from Lawrence-st. to Valley drive; paving an alley with brick. Petitions have been referred to the city engineer for paving Bellefontaine-st., from Massachusetts-ave. to Fifteenth-st., with asphalt and creosoted wooden blocks.

Chicago, Ill.—The property-owners on Ashland-ave., between Twelfth and Twenty-second-sts., demanded recently that the street car company pave between its tracks with asphalt, which the commissioner of public works ordered done. The property-owners on Sheffield-ave., between Maud-ave. and Concord-place, have petitioned for the repaving of that street. A new system of street improvements for about 15 mis. of streets in Roseland, Gano, Kensington and West Roseland is being considered. Commissioner McGann is considering plans for laying a strip of granite on all asphalt-paved streets on which street car tracks are laid, as an experiment. Considerable expense has been caused by the wearing of the pavement by vehicles which use one rail of the car tracks.

CONTRACTS TO BE LET.

Toronto, O.—Bids are asked until Sept. 15 for laying sidewalks. D. O. Ault, cy. clk.

Buffalo, N. Y.—Bids are asked until Sept. 7 for paving Forest-st. R. G. Parsons, secy. B. P. W.

Plainfield, N. J.—Bids are asked until Sept. 5 for macadamizing two streets. J. T. MacMurray, cy. clk.

Amsterdam, N. Y.—Bids are asked until Sept. 5 for grading Union-st. Thos. J. Hazlett, cy. clk.

Roanoke, Va.—Bids are asked until Sept. 6 for macadamizing three streets. J. H. Wingate, cy. engr.

Cincinnati, O.—Bids are asked until Sept. 2 for improving Van Blaricum road, Green twp. E. L. Lewis, co. audt.

Youngstown, O.—Bids are asked until Sept. 9 for paving W. Rayen-st., from Market to Watt. C. E. Cross, cy. clk.

Defiance, O.—Bids are asked until Sept. 9 for improving Holgate-ave. and Perry-st. J. J. Mallery, cy. clk.

St. Paul, Minn.—Bids will be received until Sept. 4 for paving Wabasha-st., from Second-st. to the river bridge.

Winona, Minn.—Bids will be received until Sept. 11 for paving an alley with brick. Cy. Engr. Heuston.

Hammond, Ind.—Bids are asked until Sept. 12 for macadamizing Clinton, Russell and Douglas-sts. Peter J. Lyons, cy. engr.

Birmingham, Ala.—Bids are asked until Sept. 6 for 18,000 sq. yds. of brick paving. Julian Kennedy, cy. engr.

Port Clinton, O.—Bids are asked until Sept. 23 for paving Second-st. with block and curbing. Geo. F. Meyer, vil. clk.

Gas City, Ind.—Bids are asked until Sept. 5 for constructing 9,409 ft. of brick sidewalk. J. R. Hadley, cy. atty.

Wellston, O.—Bids are asked until Sept. 11 for the improvement of Pennsylvania-ave. T. P. Wangler, cy. clk.

South Bend, Ind.—Bids are asked until Sept. 1 for grading and cement curbing in sundry streets. L. A. Hull, cy. clk.

New Rochelle, N. Y.—Bids are asked until Sept. 5 for sheet asphalt, block asphalt and brick paving. Mayor Dillon.

Toledo, O.—Bids are asked until Sept. 18 for paving Vermont-st., from Bancroft to Cherry-st., with block or asphalt. Wm. O. Holst, cy. clk.

Gallipolis, O.—Bids are asked until Sept. 18 for paving sundry streets with vitrified paving brick. T. E. Bradbury, cy. clk.

Appleton, Wis.—Bids are asked until Sept. 6 for macadam paving and stone curbs in two streets. M. K. Gochnauer, cy. clk.

Braddock, Pa.—Bids are asked until Sept. 4 for paving three streets and three alleys with brick. William Howat, supt. pub. wks.

Greenville, O.—Bids are asked until Sept. 14 for paving six streets with brick. Eliot M. Milier, cy. clk.; W. D. Brumbaugh, cy. engr.

Wauseon, O.—Bids are asked for until Sept. 4 for constructing about 16,500 sq. yds. of brick paving. H. S. Bloomer, cy. clk.

Akron, O.—Bids are asked for until Sept. 16 for paving Fay-st., from Market to Buchtel, with brick. Chas. H. Isbel, clk. bd. cy. comrs.

Paterson, N. J.—Bids are asked for until Sept. 1 for grading Mohawk and Lincoln-

aves. in the borough of Hawthorne. Arthur F. J. Wheatley, clk.

Hoboken, N. J.—Bids are asked for until Sept. 13 for improving Jackson-st., between Third and Fourth. M. V. McDermott, cy. clk.

Lebanon, Ind.—Bids are asked for until Sept. 4 for grading and graveling the Jackson free gravel road, 11,936 ft. Geo. B. Jones, engr. and supt.

Vevay, Ind.—Bids are asked until Sept. 11 for building free gravel and macadamized roads in Cotton twp. J. E. Hart, co. audt.

Port Huron, Mich.—Bids are asked for until Sept. 2 for macadamizing Gratiot-ave., from Garfield-st. to Holland-ave. R. D. O'Keefe, supt. pub. wks.

Janesville, Wis.—Bids are asked for until Sept. 9 for 7,000 sq. yds. of brick paving on 6-in. concrete, on W. Milwaukee-st. P. F. Brown, cy. engr.

Lima, O.—Bids are asked until Sept. 13 for paving three streets with brick or block, 10,700 sq. yds., and for catch basins, drainage, etc. C. E. Lynch, cy. clk.

Ashtabula, O.—Bids are asked until Sept. 2 for about 9,200 sq. yds. of brick paving and about 15,000 ft. B. M. of beech plank road. Frank W. Wagner, cy. clk.

Pecatonica, Ill.—Bids are asked until Sept. 4 for macadmizing, curbing, brick paving and tar sidewalk on Main-st. Vil. clk. or st. alley com.

Washington, D. C.—Bids are asked until Sept. 2 for grading a roadway from Brightwood-ave. across Rock Creek Park. W. E. Craighill, John W. Ross, acting comrs.

Indianapolis, Ind.—Bids are asked until Sept. 4 for paving Market-st. with brick on 6-in. hydraulic cement stone foundation. M. A. Downing, chrm. B. P. W.

Norfolk, Va.—Bids are asked until Sept. 2 for laying 5,000 sq. ft. of vitrified brick pavement on concrete base at the Navy Yard. Mordecai. T. Endicott, chief of bureau, Washington, D. C.

Evansville, Ind.—Bids are asked until Sept. 2 for paving College-st., from First to Second-st., with brick. Bids are asked until Sept. 9 for paving six alleys with brick. Geo. W. Swearingen, clk B. P. W.

Toledo, O.—Bids are asked until Sept. 4 for paving Colburn-st., from Maumee to Broadway, with mfrd. blocks or bricks. Trinidad Pitch lake asphalt, Trinidad or Assyrian asphalt. Wm O. Holst, cy. clk.

Elizabeth, N. J.—Bids are asked until Sept. 1 for constructing about 4,977 sq. yds. of trap block pavement, resetting about 2,395 lin. fr. of curbing and 230 lin. ft. of new curbing. N. K. Thompson, str. comr.

Reading, Pa.—Bids are asked until Sept. 4, change of date, for 12,000 lin. ft. granite curbing, 48,300 sq. yds. of asphalt paving and 2,400 sq. yds. of brick or block paving. Samuel S. Hoff, cy. engr.

Veedersburg, Ind.—(Special). Bids are asked until Sept. 8 for paving Second and Main sts., consisting of the folowing exc., 6,573 cu. yds.; straight curb, 2,708 lin. ft.; round corners, 138 lin. ft.; oak marginals, 2,000 ft.; sand cushion, 457 cu. yds.; gravel for concrete, 1,480 cu. yds.; and for cincrete, 644 cu. yds.; Portland cement, 864 bbls.; cement filler, 8,233 sq. yds.; coarse gravel for curb trenches, 123 cu. yds.; vitrified paving block, 331,000. I. J. Walker, town clk.

CONTRACTS AWARDED.

Geneva, N. Y.—C. E. Emerick was awarded the contract for macadam paving in High-st.

Lenox, Mass.—Asa Gardner, of Worcester, secured the contract for 3 mis. of new road.

Centerville Station, Ill.—J. Rider was awarded the contract for a new rock road, for about $35,500.

Rochester, N. Y.—H. B. Hooker was awarded the contract for paving Chamberlain-st. with brick for $4,868.

Brimfield, Conn.—The contract for building a macadam road was awarded Aug. 10 to Andrew Corbin for $6,287.

White Plains, N. Y.—Duffy & McCabe secured the contract for macadamizing four highways for $70,810.32.

Chattanooga, Tenn.—The contract for paving Market-st. with brick was awarded to the Tennessee Paving Brick company.

Hicksville, O.—The contract for paving High-st. with brick was awarded to Clemmer & Johnson for $24,000.

Lima, O.—The contract for paving Wayne, Elm and Eureka-sts. was awarded to McArthur Bros. Hallwood block will be used.

Milford, Del.—Sweeten & Son, Camden, N. J., secured the contract for brick paving at $2.02 a sq. yd. and 54 cents for gravel road.

Boonville, Ind.—The contract for building 29 mis. of macadam road was awarded Aug. 3 to the White & Walker Construction company.

Kansas City, Mo.—W. G. Shaw, of Independence, secured the contract for grading and macadamizing about 6 mis. of road for $12,000.

Kewanee, Ill.—The Purington Paving Brick company secured the contract for furnishing brick for about 25,000 sq. yds. of paving in this city.

Cortland, N. Y.—The contract for paving Port Watson-st. was awarded to the Warren-Scharf Asphalt Paving company at $2.33 a sq. yd.

Fulton, N. Y.—The contract for paving First-st. with brick was awarded Aug. 14 to the Walter Bradley Construction company at $1.87 a sq. yd.

Armourdale, Kas.—The contract for repaving Osage-ave., from Adams to Twelfth-st., was awarded to the Barber Asphalt company, at $2.10 a sq. yd.

Cincinnati, O.—The contract for repaving Third-st., from Main to Vine, with asphalt was awarded to the Warren-Scharf Asphalt company, for $6,460.76.

Paulding, O.—The contract for 1,400 sq. yds. of brick paving was awarded Aug. 9 to C. B. Hall of Findlay, O., at $1.03 a sq. yd. or $2,870.

Salem, Ill.—The contract for 25,000 ft. of granitoid sidewalks on Main and Broadway-sts. was awarded to Mark Bird of East St. Louis at 17 cts. a sq. ft.

Spokane, Wash.—The Alcatarz Asphalt Paving company, Los Angles, Cal., was awarded the contract for paving Howard, Monroe, Lincoln and Stevens-sts. with asphalt for $57,356.

St. Louis, Mo.—The Barber Asphalt Paving company was awarded the contract, Aug. 22, for the reconstruction of Grand-ave., from Laclede-ave. to Easton, with asphalt.

West Chester, Pa.—The contract for about 10,000 sq. yds. of paving on Market and High-sts. will be awarded, according to press reports, to the Brick and Tile company of Norristown at $1.65 a sq. yd.

Syracuse, N. Y.—Bids were received Aug. 7 for paving N. Clinton, Canal and McBride-sts. and Leavenworth-ave. The Standard Asphalt company, a new bidder in the field, was the lowest on all the streets.

Highland Park, Mich.—Contracts were awarded Aug. 3 for paving Woodard-ave with 1½-in. asphalt on 6-in. concrete, as follows: Section 15. Barber Asphalt Paving company, $79,785; section 16, American Contracting company, $80,430.

East Liverpool, O.—Bids were received Aug. 7 for paving as follows: Foley Bros., Columbus, O., $23,351; J. M. Miller, Youngstown, O., $27,472; . S. Rinehart, East Liverpool, $28,753; J. W. Logan, Manchester, Pa., $34,281.

Detroit, Mich.—The contract for paving Morgan-st. with cedar block with Elyria curbstone was awarded to John MacVicar at $1.42 a sq. yd., or $1,230.60. Lemane Bros. secured the contract forpaving W. Fort-st with Nelsonville brick.

Elmira, N. Y.—The contract for paving

State-st., between Second and Fifth-sts., was awarded to Frederick J. Baker for $20,000. The contract for supplying granite blocks for the paving was awarded to John A. Reddington of Whitehaven, Pa.

Evansville, Ind.—Contracts for paving alleys with brick were awarded Aug. 19 as follows: Bedford, Weikel & Nugent, five contracts, $1.41, $1.45, $1.42 and $1.35 a sq. yd.; Stinchfield & Saunders, three contracts, $1.43, $1.40 and $1.34 a sq. yd.

Tacoma, Wash.—Paving contracts have been awarded as follows: S. Eleventh-st., $4,000; A-st., $13,375; S. Ninth-st., $4,123, J. C. Dickson; Jefferson-ave., Savage & Scofield, $17,337; C-st., $13 000; St. Helens-ave., $1,290; C-st., $46,924, Rydstrom & Goerig.

Topeka, Kas.—The contract for paving Fillmore and King-sts., Greenwood and Willow-aves., and Thirteenth, Tyler and Taylor-sts., with brick, was awarded to John Ritchine, Aug. 14, at $1.22 a sq. yd. The contract for paving certain alleys was awarded to R. B. Kepley, at $1.22 3-10 a sq. yd.

St. Paul, Minn.—The contract for brick paving on Sherburne-ave., from Rice to Cedar-sts., and Robert, from Seventh to Eighth, was awarded to Fielding & Shepley, for $9,256. The contract for paving Sixth-st., from College to Smith-ave., with sandstone, was also awarded to Fielding & Shepley, for $4,240.

Newark, N. J.—David Harper secured contracts, Aug. 17, for granite paving on sand, as follows: Front and Lombardy-sts., $1.59; Lombardy-place, $4.50. The contract for grading and curbing Fifteenth-ave. was awarded to Van Steenburgh & Clark for $3,701, and for S. Fifteenth-st. to Patrick Donuhue for $2,459.50.

Camden, N. J.—Paving contracts were awarded, Aug. 15, as follows: Broadway and Kaighn-aves., asphalt, Vulcanite Paving Co., $2.51 a sq. yd.; Carpenter and Washington-sts., Vulcanite Co., $2.52; Mechanic-st., Belgian block, B. F. Sweeten & Sons, $1.37 a sq. yd.; Pine, Vine and Linden-sts., Belgian blocks, T. A. Wilson, $1.35.

Kansas City, Mo.—Bids were received, Aug. 16, for paving Benton boulevard, from Twenty-fourth to Thirty-first-st. as follows: J. A. Andrew, $1.83 a sq. yd. for paving and 25 cents a sq. ft. for artificial stone area ways; Adam Armstrong Paving company, $1.81 for paving and 30 cents a sq. ft. for area ways. The contract was awarded to Adam Armstrong.

Chicago, Ill.—Paving contracts were awarded, Aug. 2, as follows: Rush-st., from Chicago-ave. to Rush-st., Bermudez Asphalt Co.; Cedar-st., from N. State to Lake Shore drive, Chestnut, from N. State to Lincoln Park boulevard, and Ontario-st., Western Paving and Supply company; S. Claremont-st., from W. Van Buren to W. Harrison-st., and Gladys-ave., from S. Western-ave. to Stanley Terrace, Barber Asphalt Paving company; curbing and macadamizing N. Ridgeway, N. Lawndale and Monticello-aves., and W. Byron-st., Henry Rath; asphalt paving, W. Monroe-st., Jas. A. Sackley.

St. Louis, Mo.—The Barber Asphalt company secured contracts for paving Grand-ave., from Morgan to Eastern-ave., 804 squares, and from Laclede to Morgan, 978 squares, as follows: Taking up old pavement and preparing roadbed for superstructure, 50 cents per sq. 100 ft.; new 4-in. limestone curbing, 54 cents per lin. ft.; taking up and resetting old curb, 7 cents per lin. ft.; hydraulic cement concrete, 3-in. deep, $3.33 per sq. 100 ft.; laying bituminous concrete binder course, 1½ ins. deep, $5.90 per sq. 100 ft.; Trinidad lake asphalt paving, $12 per sq. 100 ft.; maintenance per annum, 40 cents per sq. 100 ft.; totals, $20,526.94 and $25,171.64 respectively.

Indianapolis, Ind.—The Capitol Paving and Construction company was awarded the contract for paving Susquehanna-st., from Michigan to North, with brick, at $1.90 a lin. ft. Contracts were awarded Aug. 28 as follows: Paving alley with brick, Capitol Paving and Construction company, $1.39 a lin. ft.; gravel roadway and cement walks, Morris-st., from Sheffield-ave. to Tremont-st., Henry T. Nolting, $1.11; graveling alley, J. Harry Roberts, 25 cents a lin. ft. Cement sidewalk—Pratt-st., Penn. to Illinois, J. C. Veney, 47 cents for 4-ft. walks and 35½ cents for 3-ft walks; Brookside-ave., R. D. Drake, 57½ cents; Morris-st., from Belmont-ave. to Sheffield-st., Henry Maag, 58 cents; Church-st., from McCarty to Ray, Percy F. Tall, $1.09.

SEWERS.

Marion, Ind.—The sewage disposal plant, for which bids are being invited, will have "head-end" cinders from locomotive smoke-boxes as the filtering material. Sand suitable for this purpose is not available. The cinders are uniform and porous. The septic tank will have concrete walls and bottom, brick piers and brick and concrete roof arches.

Cleveland, O.—The state board of health passed a resolution Aug. 18 to the effect that the board is unwilling to approve any plan of sewage disposal which contemplates the discharge of crude sewage into Lake Erie or the Cuyahoga river at any point within ten miles of the city's intake of drinking water. This resolution affects Lakewood Hamlet and South Brooklyn.

CONTRACTS TO BE LET.

Sansalito, Cal.—Bids are asked until Sept. 4 for pipe sewers. J. M. Pryor, town clk.

Lima, O.—Bids are asked until Sept. 13 for catch basins, drainage, etc. C. E. Lynch, cy. slk.

Cedar Rapids, Ia.—Bids are asked until Sept. 1 for a sewer. R. N. Beck, chrmn. com. pub. imp.

Houghton, Mich.—Bids are asked until Sept. 1 for building a sewerage system. Casper Brand, vil. clk.

Albert Lea, Minn.—Bids are asked until Sept. 1 for a new sewer in the south part of the city. Cy. clk.

Oshkosh, Wis.—Bids are asked until Sept. 5 for a sewer in Cleveland and E. Oak-sts. Frank Monahan, chrm. B. P. W.

Cincinnati, O.—Bids are asked until Sept. 4 for for sewers and drains in Burnet-ave. Samuel Nieman, prest. bd. cy. affairs.

Greenville, Miss.—Bids are asked until Sept. 5 for survey, plans, etc., for a sewerage system. J. M. Lee, cy. clk.

Mt. Vernon, N. Y.—Bids are asked until Sept. 5 for waterproofing sewage receiving basins (postponed from Aug. 15). W. M. Hoyt, cy. clk.

South Bend, Ind.—Bids are asked until Sept. 1 for vitrified salt glazed pipe sewers in sundry streets. L. A. Hall, cy clk.

Glenville, O.—Bids are asked until Sept. 15 for constructing sewers, drains, manholes and flush tanks. Ira C. Farley, vil. clk.

Youngstown, O.—Bids are asked until Sept. 9 for sewer in Emerald, N. Walnut, Holmes and W. Rayen-sts. C. E. Cross, clk. cy. comrs.

Longmeadow, Mass.—Bids are asked until Sept 28 for furnishing and laying 7,300 ft. of 6, 8, 10-ft. sewer pipe in Longmeadow-st. C. S. Newell, selectman.

Salt Lake City, Utah.—Bids are asked until Sept. 15 for sewerage construction at the University of Utah. Address University of Utah.

Jackson, Miss.—(Special.)—Bids are asked until Sept. 5 for a system of house and storm sewers, about 24-mls. D. P. Porter, Jr., clk.; Walter G. Kirkpatrick, Jr.

Alma, Wis.—Bids are asked until Sept. 4 for an open sewer 35 ft. long, a stone arched

culvert and for opening a culvert. Chris. Fuoter, cy. clk.

Napoleon, O.—Bids are asked until Sept. 14 for constructing vitrified and salt-glazed sewer pipe and cast iron pipe. Jos. P. Mason, v l. clk.

Wadsworth, Nev.—Bids are asked until Sept. 14 for a sewerage and water system at the Pyramid Lake boarding school. Fred B. Spriggs, U. S. Indian Agt., Wadsworth.

Columbus Barracks, O.—Bids are asked until Sept. 1 for furnishing and delivering sewer pipes, drains and materials for a sewerage and drainage system. Constructing Q. M.

Collinwood, O.—Bids are asked until Sept. 18 for the construction of drains in sewer and drainage district No. 1, comprising approximately 25,000 lin. ft. of 5 to 24-in. pipe drains. L. A. Wilson, vil. clk.

CONTEMPLATED WORK.

Merced, Cal.—A sewerage system is proposed.

Newport, Ark.—Bids will be advertised for soon for a sewerage system.

Delray, Mich.—The council has voted to build a sewer.

Leicester, Mass.—This city is in need of a sewerage system.

Everett, Wash.—A sewerage system is contemplated.

Loraine, O.—A petition for a sewer in Second-ave. has been filed.

Caribou, Me.—The question of building a sewerage system is urged.

Canton, S. D.—An ordinance has been passed providing for a sewerage system.

Allegheny, Pa.—A resolution has been passed to build four lateral sewers.

Ft. Wayne, Ind.—Mayor Scherer favors the intercepting project.

Elyria, O.—Plans and specifications for a sewer in N. Eighth-st. will be prepared.

Greensburg, Pa.—An ordinance has been passed for 3,000 ft. of pipe sewers.

Paxton, Ill.—The question of building a sewerage system will be voted on next spring.

Mattoon, Ill.—The contract will soon be let for one-half mile of sewers. A. C. Loomis, cy. engr.

Syracuse, N. Y.—A trunk sewer in the West End is proposed. Sam'l Dempsey, chrmn. com.

Bridgefield Park, N. J.—The estimated cost of a sewerage system is $50,000 to $100,000.

Hamilton, O.—Plans for a sewer on Buckeye-st. have been prepared. A. L. Dillon, cy. engr.

York, Pa.—A resolution has been adopted declaring a complete sewerage system necessary.

Corvallis, Ore.—Plans and specifications are being prepared for a new sewerage system.

Jersey City, N. J.—A sewer is proposed for Greenville-ave., from the boulevard to Woodlawn-ave.

Chattanooga, Tenn.—The street committee has decided to build sewers in different parts of the city.

New Britain, Conn.—Estimates for sewage disposal will probably be considered this fall.

Canton, O.—A resolution has been passed for a sewer in Cassilly-st. Louis N. Ley, cy. clk.

Lake Linden, Mich.—The village council contemplates building three lateral sewers; estimated cost, $5,591.85.

The Dalles, Ore.—A sewerage system is contemplated at a cost of from $20,000 to $30,000.

Holyoke, Mass.—The question of a sewerage system will have to be considered soon.

Newburgh, N. Y.—Sewers are contemplated in West and S. William-sts. C. Caldwell, cy. engr.

Granite City, Ill.—Plans for a sewerage system have been prepared by Julius Pitzman, C. E., St. Louis, Mo.

Alexandria, Ind.—Plans for a sewerage system have been prepared by Dr. Hurty of the state board of health.

Pensacola, Fla.—The question of issuing bonds for sewers will be voted on in October.

Winona, Minn.—The board of health unanimously favors the extension of the sewers in the Second district.

Owensboro, Ky.—An ordinance providing for a sewer in Main and E. Main-sts. has been passed.

Niles, O.—An ordinance is being prepared for 1¼ mis. of brick and pipe sewers, with four flush tanks. Wm. Wilson, cy. engr.

Oil City, Pa.—An ordinance has been passed for a main sewer in the Twenty-third district on Crowell-ave. and W. First-st.

Denver, Col.—An auxiliary sewer, to drain the excess sewage of the Sixteenth-st. sewer district, is proposed.

St. Paul, Minn.—Plans and estimates for six small sewers have been prepared by the city engineer.

Iowa Falls, Ia.—The city contemplates a survey preparatory to building a sewerage system.

Philadelphia, Pa.—A new sewer in the Cohocksuik is proposed at a cost of $225,000. Councilman August Heil.

Pittsburg, Pa.—The question of issuing $200,000 in bonds for main sewers will be voted on in September. W. J. Diehl, mayor.

Providence, R. I.—A resolution has been passed adding the sum of $100,000 to the appropriation for the construction of sewers.

Newark, N. J.—Ordinances have been passed for a pipe sewer in S. Tenth-st., and a main pipe sewer in Avenue C, with a branch sewer in Vanderpool-st.

Lansdowne, Pa.—The question of issuing an additional $15,000 to complete the fund of $25,000 for the sewer to tidewater will probably be voted on in November.

Vicksburg, Miss.—The movement for a sewerage system was inaugurated Aug. 8 by the Board of Trade passing resolutions urging the city officials to take immediate steps in the matter.

Philadelphia, Pa.—The citizens of the Sixteenth, Seventeenth and Twentieth wards have asked the mayor and councils to aid in formulating plans and securing an appropriation for better sewers.

South Portland, Me.—A petition has been circulated and will be sent to the state board of health calling attention to the unsanitary condition of the sewerage system at Sanford and High-sts.

Wakefield, Mass.—An engineer has been engaged to make an estimate of the cost of connecting with the Metropolitan sewerage system and maintaining a filtration system on the Montrose-ave. site.

Hartford, Conn.—City Engineer Bunce submitted to the street board, Aug. 9, a plan for a sewer in Albany-ave. A petition is being signed asking for relief from a brook in the southwestern section of the city, which, it is claimed, is defiled by sewage.

Newark, N. J.—Representatives from the municipalities of South Orange, Vailsburg, Irvington and Summit met in this city Aug. 24 to discuss the plans for the proposed joint sewer to tidewater. Another meeting will be held Sept. 14, when a rough draft of the ordinance necessary for each municipality to adopt to expedite matters will be prepared.

CONTRACTS AWARDED.

Whitestone, L. I.—The contract for a sewer in Twenty-first-st. was awarded to Peace Bros.

Hibbing, Minn.—The contract for a sewer was awarded to Alexander Saug, of West Duluth.

Eagle River, Wis.—The contract for a sewer was awarded to Amos Radcliffe, for $1,500.

St. Cloud, Minn.—Webster & Blake, of Dubuque, secured the contract for the lower town sewer for $18,650.

Kingston, N. Y.—The contract for the Second and Ninth ward trunk sewer was awarded to Urban Miller.

Normal, Ill.—Thos. Sylvester, of this city, was awarded the contract for a sewer for $15,747.47.

La Crosse, Wis.—The contract for the intercepting sewer was awarded to G. Maffioli, of Rockford, Ill., for $10,778.25.

Norfolk, Va.—Guild & Co., of Chattanooga, secured the contract for the Brambleton sewerage system for $14,000.

Anaconda, Mont.—The contract for a sewer in Oakland ave. has been awarded to Wm. Hawkins for $2,300.

Beloit, Wis.—The contract for building a sewer was awarded to Harding & Nelson, of Racine, for about $9,000.

Columbus, O.—S. T. Knight submitted the lowest bid, Aug. 19, for a 24-in. brick sewer in Chapel-st. for $3,733.50.

Boston, Mass.—The contract for improving section 4 of Spot Pond was awarded to Moulton & O'Mahoney, of this city, for $78,630.

Hammond, Ind.—The contracts for sewers were awarded to Nash & Dowdle, of Chicago, as follows: Sheffield-ave., $5.10 a lin. ft.; Gostlin-st., $4.

East Orange, N. J.—The contract for a sewer in the north and south boulevard has been awarded to Daniel F. Minnehan, of Orange, for $217,745.

Seattle, Wash.—Sewer contracts have been awarded as follows: Second-ave., Stirrat & Goetz, $9,303.60; Third-ave., F. McLelland, $3,880.70.

Marion, Ind.—The contract for building the sewerage disposal plant and the connecting sewer was awarded to Ford & Delahunt, of Cedar Rapids, for $5,400.

Chicago, Ill.—Sewer contracts have been awarded to H. J. McNichols, Jas. Murphy, Andrew Maloney, Thos. Drury, Nash Bros., M. J. Joyce, Byrne & Shortall and James Healy.

Allegheny, Pa.—Sewer contracts have been awarded as follows: Rebecca-st. $756.50 and Church-ave. $1,245, Ott Bros.; Anna-st., Thos. Prosser, $1,295; Herman-st., John Carson & Co., $552.50.

Norristown, Pa.—The contract for a sewer in Haws-ave. was awarded to Jas. Walsh Aug. 15 as follows: Northwest side of street—Main, 77 cts. per ft.; laterals, 76 cts.; flush tank, $125. Southwest side—Main, 71½ cts.; laterals, 72 cts.; flush tank, $125.

Philadelphia, Pa.—Sewer contracts have been awarded to Daniel Dooley, F. L. Mills, Howard E. Ruch, Richard Walsh, Robert Higgins, C. D. Fond, B. F. Dutton, R. P. Bennis, J. B. Riley company, Jas. Perna and M. P. Quinn. The contract for a sewer along the bed of the Aramingo canal has been awarded to Michael J. O'Rourke for $191,818.50.

Altoona, Pa.—(Special.)—Harvey Linton, cy. engr., says sewer contracts were awarded Aug. 19 as follows: Isaac Bender—Floyd-st., $1.38 per ft.; storm water inlet, $20; Crawford-ave., 64 cts. per ft.; air inlet, $7; Third ave., 69 cts., air inlet included; P. J. Fagan & Co., seven contracts, 44, 69, 47, 70 and 54 cts. Chas. B. Clark, three contracts, 59 and 61 cts. and air inlets $5.50.

WATER-WORKS.

Manistee, Mich.—This city will own its own water works.

Ann Arbor, Mich.—Municipal ownership of water warks is favored.

Ottumwa, Ia.—An ordinance has been passed favorable to municipal ownership.

Wellington, Kas.—The city council has voted in favor of municipal ownership.

Williamstown, Mass.—The question of purchasing the public water works is being considered.

Alton, Ill.—The water works committee has adopted resolutions favorable to municipal ownership of water works.

Burlington, Ia.—The city council has adopted a resolution favorable to municipal ownership of the water works.

Millville, Pa.—A receiver will probably be appointed to take charge of and operate the Bennett Water company.

St. Joseph, Mo.—An ordinance has been introduced providing for a contract with the St. Joseph Water company for a term of 20 years. It was referred to a committee.

Lowell, Mass.—The Massachusetts state board of health has investigated the matter of lead poisoning from lead service pipes in this city and reports that the trouble is due to the carbonic acid in the water from two or three driven well plants in the city.

Newly incorporated companies: Saratoga Water company, Saratoga, N. Y.; South Mountain Water company, Redlands, Cal.; Domestic Water company, Fall Brook Station, Cal.; Morris Plains Aqueduct and Water company, Morris Plains, N. J.; Laporte Water Supply company, Laporte, Ind.

Newark, N. J.—Oak Ridge, Canistear and Clinton reservoirs were visited Aug. 25 by the commissioners of the board of works and Engineer Sherrerd, who reached the conclusion that the East Jersey Water company will soon be compelled to open the gates of the Canistear reservoir, which is still sealed. The Clinton and Oak Ridge reservoirs are nearly exhausted.

Evansville, Ind.—Electrolysis has rendered the water works in certain streets so unsafe that they will have to be replaced. Mr. E. E. Brownell of Dayton, O., says there is more danger to the water system in that city under the same conditions than any other city in Indiana. It is the first city in the state where the pipes have been found pitted on the inside.

CONTEMPLATED WORK.

Racine, Wis.—A new water works system is contemplated.

Pleasanton, Cal.—The extension of the water works is proposed.

Newport, Ark.—Bids will be advertised for soon for a water works system.

Hoosick Falls, N. Y.—The water mains will be extended.

Mt. Morris, N. Y.—The village board has decided to extend the water mains.

Como Depot, Miss.—Plans have been prepared for a water works system.

Orange, N. J.—Mayor Stetson urges immediate action in securing a better water supply.

Bayonne, N. J.—The common council has ordered the sale of bonds for the extension of water mains.

Ottawa, Canada.—The estimated cost of improving the water works is $67,000. Cy. Engr. Galt.

Batavia, N. Y.—A committee will be appointed to investigate the question of securing a supply of fresh water. Mayor Sanford.

Springfield, O.—A water famine is threatening the city, according to local press reports.

Denver, Col.—The question of issuing bonds for the purchase or erection of a municipal plant will be voted on.

Pittsburg, Pa.—The question of building a filtration plant, purchasing meters, etc., will be voted on Sept. 19. W. J. Diehl, mayor.

The question of issuing water works bonds will be voted as follows: Elyria, O.; Collinwood, O., Sept. 11; Schuylerville, N. Y.; Armada, Mich., San Luis Obispo, Cal.; Hillsboro, N. D.; Ida Grove, Ia.

Detroit, Mich.—About 3 mls. of mains will be laid to supply the northern part of the city. This will necessitate the enlargement of the pumping station and the erection of two new engines.

The construction of water works systems is contemplated at the following places: Owenton, Tenn.; Chinook, Mont.; Munfordville, Ky.; Geneva, O.; Two Rivers, Mich.; Clyde, N. Y.; Buda, Ill.; Dumont, Ia.; New Albin, Ia.; South Coventry, Conn.; Casey, Ill.; Greenwood, Miss.; Chariton, Ia.; Trenton, Ill.; Arcadia, Wis.; Norway, Ia.; Brinkley, Ark.; Yreka, Cal.; Mandan, N. D.; Wimbledon, N. D.

Sardis, Miss.—Bids are asked until Sept. 5 for water works. C. W. Duval, town clk.

Rockymount, N. C.—Bids are asked until Sept. 1 for a water works system. F. T. Thorne, town clk.

Hawley, Pa.—Bids will be received until Aug. 4 for water works. Victor A. Decker, boro. secy.

Oskaloosa, Ia.—Bids are asked until Sept. 5 for supplying this city with water for twenty-five years. D. C. Waggoner, cy. clk.

Lakefield, Minn.—Bids are asked until Sept. 16 for a water works and electric light system. S. R. Dubetz, vil. rec.

Berryville, Va.—Bids are asked until Sept. 14 for furnishing and laying cast iron pipe, etc. D. H. Jones, mayor.

Wells, Minn.—Bids are asked until Sept. 8 for furnishing and laying 670 ft. 4-in. water pipe and one hydrant. H. W. Busho, vil. rec.

Tama, Ia.—(Special)—Bids will be received until Sept. 1 for furnishing pipe and fittings and laying the same. D. T. Mauller, cy. clk.

Toledo, O.—Bids are asked until Sept. 4 for boring an artesian well at the corner of Buckeye and Niagara-sts. William O. Holst, cy. clk.

Indianapolis, Ind.—Bids are asked until Sept. 5 for a water supply for the new building for the incurable insane. John MacGregor, chrmn. co. comrs.

New York City—Bids are asked until Sept. 6 for building overflow and blow-off sewer, water pipes and appurtenances, in connection with Jerome park reservoir of the new Croton aqueduct in Twenty-fourth ward, borough of Bronx. John J. Ryan, prest. aq. comrs.

Cincinnati, O.—Bids were asked until Sept. 8 for the protection of the Little Miami river bank with piling, sheet piling and loose rock, on and near the water works grounds, near California. Chas. G. Roth, clk. bd. trustees, comrs. w. w.

CONTRACTS AWARDED.

Casper, Wyo.—Jos. F. Stanley secured the contract for building the city reservoir Aug. 18 for $4,000.

Hudson, Ia.—The contract for building water works was awarded, Aug. 7, to Jackson & Moss of Des Moines for $4,750.

East Jordan, Mich.—The contract for building new water works was awarded to T. C. Brooks & Sons of Jackson, Mich., for $11,845.

Saugerties, N. Y.—The contract for cast iron pipe with specials has been awarded to John Doyle, Albany, N. Y., at 80 cts. per ft.

Laporte, Ind.—The contract for constructing the new water works was awarded to W. H. Wheeler of Beloit, Wis., Aug. 7 for $97,850.

Louisville, Ill.—Reed & Searles of Chicago secured the contract for a water works and electric light plant in this village for $11,500.

Clinton, Mass.—The contract for stripping one-third of the entire area of the water basin was awarded to Nawn & Brock of Boston for about $900,000.

Conneautville, Pa.—Contracts for building a gravity system were awarded, Aug. 15, as follows: Pipe, United States Cast Iron Pipe & Foundry company, Cleveland, O., hydrants and valves, Eddy & Co., Troy, N. Y.; other material and labor, including the building of two reservoirs, Rosser & Casto, Bellaire, O.

Albany, N. Y.—Contracts were awarded Aug. 15 as follows: Laying 20-in. pipe on Quail-st., and 6-in. pipe on Morris-st., Robert H. Strong, $2,360.70; replacing old pipe in Hudson-ave. and Beaver-st., John Doyle, $1,221.30; laying new pipe on Lexington-ave. and New Scotland plank road, John Doyle, $1,322.90.

Philadelphia, Pa.—The Worthington company, New York City, secured contracts Aug. 18 for two 5,000,000 gal. pumps, to be placed at Roxborough, at $30,000 each, and two 5,000,000 gal. pumps at Belmont and Roxborough respectively at $22,250 each. The Holly Mfg. company secured the contract for two 3,000,000 gal. pumps for Frankford, at $17,276 each. Macey, Henderson & Co. secured the contract for erecting the engine house and intake at Roxborough, for $63,972, for the boiler house, for $18,927, and for the electric crane, for $6,605. Robt. Wetherill & Co. secured the contract for two boilers for the Roxborough station at $4,250 each. The other contracts were: Henry R. Worthington & Co., pump chambers and valves, $7,300; Southwark Foundry & Machine Co., pump chambers and valves, at Queen Lane pumping station, $1,525; two 3,000,000-gallon pumping engines, at Frankford high service station, the Holly Mfg. Co., at $17,276 each.

BRIDGES.

Grafton, N. D.—Bids are invited until Sept. 12 for two bridges. O. M. Fraser, co. audt.

Honesdale, Pa.—Bids will be asked soon for an iron bridge. J. E. Brucher.

Lodi, Cal.—Bids are invited until Sept. 5 for building the Hunt bridge. Town clk.

Scottsboro, Ala.—Bids will be advertised soon for a steel bridge over Paint Rock river.

Keswick, Cal.—Bids are invited until Sept. 7 for a bridge across the Sacramento river. Supervisors.

Delphi, Ind.—Bids are asked until Sept. 20 for six small bridges. Henry Wagoner, chrmn. co. comrs.

Exeter, N. H.—A new steel bridge over the Hampton river will be made necessary by the new boulevard.

Wayne, W. Va.—Bids are invited until Sept. 11 for steel and iron bridges. Jas. McIrvin, prest. co. comrs.

Newburyport, Mass.—The old suspension bridge across the Merrimack river, about 3 mls. above the city, is to be strengthened.

Omaha, Neb.—Bids are invited until Sept. 5 for building 12 iron bridges in Harlan county. Sam L. Roberts, co. clk.

Des Moines, Ia.—Sealed proposals are invited until Sept. 5 for a bridge at E. Sixth-st., over the Des Moines river. B. P. W.

Pulaski City, Va.—Bids are asked until Sept. 16 for a steel highway bridge across the New river, at Towe's Ferry. J. R. K. Bell.

Delaware, O.—Bids are invited until Sept. 15 for building a steel bridge over Mill creek at Bellepoint. Lyman P. Lewis, co. audt.

Watertown, Wis.—The question of building a bridge across the Missouri river at Blue River has been favorably voted on.

New Brunswick, N. J.—The Wrought Iron Bridge company, Canton, O., secured the contract for a bridge over South river for $7,522.

Ft. Scott, Ark.—Bids are invited until Sept. 7 for a bridge in Walnut twp. across

Yellow Paint creek. H. Frankerburger, co. clk.

Lebanon, Ind.—Bids are invited until Sept. 4 for a steel bridge to span Prairie creek. David H. Shockley, co. audt.

Greenport, N. Y.—The Southold town board has decided to replace the wooden bridge at Mill creek with an iron structure.

Pittsburg, Pa.—The question of expending $700,000 for the construction and repair of bridges will be voted on Sept. 19. Wm. J. Diehl.

Frederick, Md.—Bids are asked until Sept. 4 for a steel bridge across Catoctin creek at Leatherman's ford. C. C. Ausherman, secy. co. comrs.

Decatur, Ind.—Sealed proposals will be received until Sept. 7 for a bridge in Preble twp. near Friedheim. Joseph E. Mann, chrmn. co. comrs.

Indianapolis, Ind.—Plans have been prepared for a stone bridge at Meridian-st.; Melan arch bridge at Illinois-st.; plate girder bridge at Northwestern-ave.

Folland, Conn.—This town has voted to build two iron bridges to replace the present Babcock and Jackson bridges over the Willimantic river.

Hatfield, Pa.—Bids are invited until Sept. 5 for a stone highway bridge and a steel highway bridge to span the west branch of Neshanning creek. Chas. M. Reed, audt.

Sunbury, Pa.—The citizens have voted about $125,000 by popular subscription for a river bridge. About $17,000 remains to be raised to build the bridge.

Norristown, Pa.—Bids are invited until Sept. 5 for five steel highway bridges, with masonry substructure and three stone arch highway bridges. Chas. M. Reed, chrmn. com.

GARBAGE DISPOSAL, STREET CLEANING AND SPRINKLING.

Kewanee, Ill.—A garbage crematory is needed.

Clinton, Mass.—A system of street sprinkling and garbage collection is needed.

Newport News, Va.—The board of health urges the need of a garbage crematory.

Manchester, N. H.—The purchase of a garbage crematory is being discussed.

Joliet, Ill.—The board of health will ask the council for an appropriation for a crematory.

Grand Rapids, Mich.—The city council is investigating the cost of a garbage disposal plant.

Evansville, Ind.—Sealed proposals will be received until Sept. 9 for sweeping and cleaning the streets. Geo. W. Swearingen, clk, B. P. W.

Binghamton, N. Y.—The board of street commissioners will re-advertise for bids for sweeping and cleaning the city's brick and asphalt streets

Sydney, New South Wales—Bids are asked until Nov. 3 for the (a) erection of a refuse destructor; (b) the erection and maintenance of a destructor, and the working of same for seven years, at a price per ton weight of refuse received and treated; (c) the erection and maintenance of a destructor, and the collection and destruction of garbage, for seven years, at a price per ton weight of refuse.

New Haven, Conn.—The contract for street sprinkling was awarded Aug. 17 to Alfred W. Forbes, and Patrick Mortell, of this city, for $2,753. The contract is for sprinkling that portion of the streets in which there are street railway tracks, which remains after deducting 9-ft. in width for each line of track, from Aug. 15 to Aug. 20. Under the contract the length of streets sprinkled will be 28½ mis.

Washington, D. C.—Street cleaning by hand has not been satisfactory in this city because the contractors failed to live up to the specifications. Not enough men were employed and the equipment was inadequate. The district commissioners have notified the contractor that no more violations will be permitted, and that any further willful disregard of their agreement will result in the prompt annulment of the contract.

Brooklyn, N. Y.—Bids were received for machine sweeping of 308 mis. of streets for the remainder of the year, as follows: James Duane, 317 Clinton-st., $13 a mile; M. J. Dady, 350 Fulton-st., $21; Newman & Co., 123 Hope-st., $11.40; Joseph A. McGarry, 186 Remsen-st., $10.40; Borough Construction company, 189 Montague-st., $11; Clark Bros. & Co., 177 North Seventh-st., $12.30; E. J. McKeever, 371 Fulton-st., $9.35; De Witt C. Bouker, 110 Wall-st., $9.60.

STREET LIGHTING.

Kansas City, Mo.—This city will acquire a municipal lighting plant.

Auburn, N. Y.—Bids are asked until Sept. 2 for electric lighting. Lighting com.

Topeka, Kas.—A combined gas and electric light plant is being considered for this city.

Council Bluffs, Ia.—The question of building or buying an electric light plant is being considered.

Charleston, W. Va.—Bids will be received until Sept. 21 for lighting the streets and alleys for one year. J. H. Ritter, chrm. Electric Lght. com.

Columbia, Pa.—Bids are invited until Sept. 4 for gas or electric lighting for a term of one or three years. Adam Rodenhauser, chrmn. st. and water com.

The question of electric lights will be voted on at the following places: Shelbyville, Mo., Sept. 4; Collinwood, O., Sept. 11; Almonte, Ont., Sept. 25.

Cynthiana, Ky.—Bids will be received Sept. 12 for furnishing 30 or more 1,200 or 2,000 c. p. arc and 40 or more 25 c. p. incandescent lights for five or ten years. L. S. Williams, cy. clk.

Electric light plants are contemplated at the following places: Perry, Mich.; Guthrie Center, Ia.; Lehi, Utah; Canopolis, Ont.; Casey, Ill.; Fayetteville, W. Va.; Cuero, Tex.; Highland, Ill.

Lincoln, Neb.—The suit of the Lincoln Gas company against the city of Lincoln, Neb., to enjoin the city from carrying out the ordinance lowering the price of illuminating gas to $1.35 per thousand feet, has been dismissed from the district court. It was begun again, however, in federal court at Omaha and a hearing will be given Sept. 7 on the question whether a temporary injunction should be granted.

PARKS.

Sioux City, Ia.—The citizens have petitioned the council for a public park.

South Bend, Ind.—A grove of 25 acres is being transformed into a park by Nat Free.

Denver, Col.—The purchase of the Cooper Lake tract for park purposes is urged upon Mayor Johnson.

Ypsilanti, Mich.—Plans have been suggested for a park along the lowland adjoining the Huron river.

Newark, N. J.—Bids are asked until Sept. 5 for constructing the Clifton-ave. entrance to the Branch Brook park. A. Church, secy. Essex county park com'n.

Ludington, Mich.—The common council has appropriated $5,000 for the improvement of the Filer house block for park purposes.

[Continued on p. 26.]